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THE MINERALOGICAL MAGAZINE

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191 December, 1945 Vol. XXVII

On the petrology of the ultrabasic and basic plutonic rocks of the Isle of Rum.

(With Plate XII.)

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[Read June 7, 1945.]

I. *Introduction.*

HE Isle of Rum contains one of the most interesting assemblages of plutonic rocks of Tertiary age in the British Isles. The pioneer work of Macculloch and later exploratory efforts of Judd and Geikie were followed by an admirable ount of the rocks by Harker (7), given with his usual lucidity and precision. 938 I spent a fortnight on this island, and this paper—the outcome of my visit ms merely at supplementing Harker's petrographical description by certain ntitative data in respect of the ultrabasic and basic rocks found there and of rding certain observations relating to the igneous tectonics.

he earliest phase of igneous activity on Rum was the eruption of doleritic and earitic lavas (10). As shown by Bailey (2) the eruptive phase of igneous vity was followed or accompanied by the formation of a ring-fault and two ordinate vents infilled with explosive breccia and intruded by felsite. The e inside the ring-fault was then intruded by a banded peridotite-allivalite plex and later by eucrite in the form of a semicircular ring-dike and associated ts. Finally, a granophyre boss was intruded along the western side of the abasic–basic complex.

II. *Measurement of the modal composition and granularity of rocks.*

he modal composition of rocks was determined by means of the Shand stage, ethod which, although more laborious than with stages of a later pattern, was erred for the greater freedom which it gives for correction of errors in measure- t. Certain minerals, such as iron-ore or olivine, can be estimated much more ectly than others, such as felspar, and by balancing the data one may obtain e accurate results. The recalculation of the volume percentages into weight entages allowed additional corrections. The granularity (grain-size) of rocks determined by counting the number of grains measured and then dividing total traverse per mineral by this number. This provided the average linear

intercept (l) for a given mineral in millimetres. The average linear intercept the rock (L), which is taken to represent the granularity, was calculated means of the following formula:

$$L = \frac{l_1p_1 + l_2p_2 + \ldots l_np_n}{p_1 + p_2 + \ldots + p_n}$$

in which l_1, $l_2 \ldots l_n$ are the average linear intercepts and p_1, $p_2 \ldots p_n$ are t volume percentages of the respective minerals (mesostasis excepted).

Altogether 26 rocks were measured, but to save space only the averages f peridotite, allivalite, and eucrite are given in this paper (table I), while t individual analyses are plotted on the triangular diagram (fig. 2).

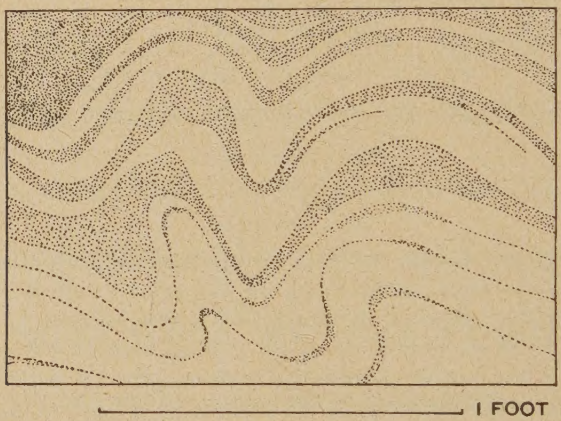


Fig. 1. Banded and contorted transition zone between peridotite (above) and allivalit (below). North-eastern shoulder of Hallival, Isle of Rum.

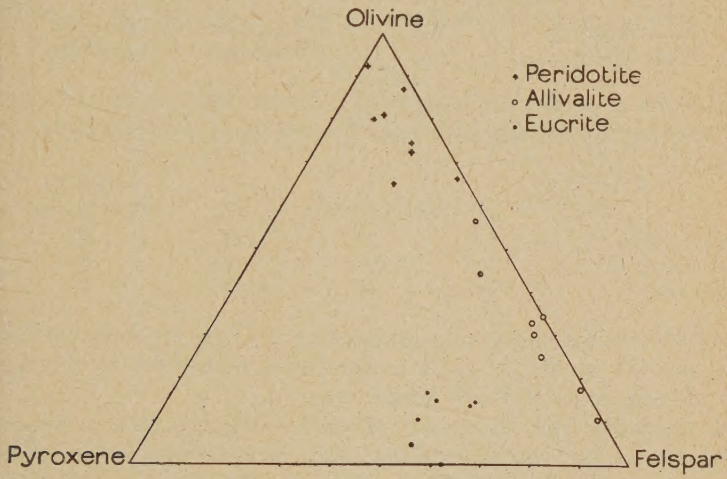
III. *The ultrabasic rocks.*

The ultrabasic complex of Rum consists of alternating thick sheets of peridot and allivalite and a subsidiary sheet of harrisite. These sheets of peridotite a allivalite, which are up to 150 feet in thickness, are, as a rule, clearly separa from each other by a sharp line of junction, but in some places the junct is gradual and extending for several feet. Such banded junction zones are of highly contorted into sharp folds and overfolds, and besides distinct bands contrasted rocks contain numerous minute streaks and lenses in a perfect flui arrangement (fig. 1). The line of separation between the individual melanocra and leucocratic bands is usually very distinct and sharp. Under the microsco however, these sharp junctions are seen to be gradational with an intimate in locking of crystals (pl. XII, fig. 2).

The major bands of peridotite and allivalite also show subsidiary minor band and streaking, often showing parallel fluidal orientation of plagioclase cryst especially in allivalite sheets in which the fluidal and fissile structure is often v pronounced. On the other hand, in the majority of peridotite sheets oliv crystals do not exhibit any obvious preferred orientation, but as shown Phillips (9) in some fissile peridotites and allivalites olivine shows signs of such

ntation. Cataclastic structure has never been observed by me among these ks, not even among rocks containing xenoliths.

number of rocks belonging to the ultrabasic complex have been measured the Shand stage. The samples were selected more or less at random from all ts of the complex—the only criterion being their fresh appearance. Altogether ıt samples of peridotite and eight of allivalite were measured and their averages presented in table I. As all the rocks described in this paper are composed



2. Triangular diagram showing the modal composition (weight per cent.) of peridotites, allivalites, and eucrites.

nly of olivine, pyroxene, and felspar, it is possible to represent their composi- on a triangular diagram (fig. 2). This diagram shows quite clearly that the abasic rocks form a continuous series ranging from an almost pure olivine k (dunite) to an almost pure plagioclase rock (anorthitite). Rigid quantitative ts separating various groups of rocks are both impossible and unnecessary. ording to Harker (7, p. 70) allivalite is composed of olivine and anorthite in roximately equal amount or with anorthite predominating.

LE I. Average modal composition of peridotite, allivalite, and eucrite calculated from eight al analyses of each type of rock and expressed in weight per cent. (L = average granularity of the rock).

	Peridotite.			Allivalite.			Eucrite.		
	Average.	Min.	Max.	Average.	Min.	Max.	Average.	Min.	Max.
ine ...	75·55	64·30	88·20	31·60	10·80	56·70	15·45	0·00	49·25
xene ...	7·20	1·60	14·55	2·90	0·00	7·85	32·80	23·50	40·00
ioclase ...	14·55	0·85	31·30	65·20	40·40	88·70	49·60	9·95	61·15
-ore ...	2·70	1·25	4·50	0·30	0·00	1·05	2·15	0·30	8·70
... ...	0·794	0·337	2·157	0·502	0·241	0·848	0·675	0·313	1·838
gr. ...	3·070	2·992	3·132	2·970	2·819	3·056	2·964	2·890	3·134

s far as I can judge the minerals in these rocks do not vary in composition, as the iron-ore and pyroxene are present in small amounts, the successive

members of this series are characterized only by the various proportions of olivi and plagioclase.

The olivine is, on the whole, fresh with only a comparatively small proport altered to serpentine and iron-ore. Often it shows a remarkable development (010) cleavage planes. As shown by Harker (7, p. 82) two varieties of olivine a present in these rocks, green and black. Both of these varieties are almo colourless in thin sections. The analyses of these two varieties, as given by Harke on recalculation show the following composition:

Green variety	21·6 fayalite	78·4 forsterite
Black variety	12·1 fayalite	87·9 forsterite

In the course of petrofabric analysis of peridotite the optic axial angles of crystals of green olivine were measured. The results of these measurements a as follows:

	No. of crystals.	$2V_\alpha$	Fayalite (weight per cent.).
Berek's method	6	84	36
On one axis	66	84½	35
On two axes	15	88	25

The results obtained by the measurement on two axes are probably the mo accurate and the results are more in agreement with those of the chemic analysis. Zoning in olivine is not conspicuous.

In the peridotites and olivine-rich allivalites olivine occurs in the form idiomorphic and hypidiomorphic crystals with rounded edges, elongated parall to the *c*-axis, and flattened on (010) (pl. XII, figs. 1 and 3). On the contrary, felspar-rich allivalites olivine is invariably moulded on felspar crystals in a ophitic fashion (pl. XII, fig. 4).

The felspar is very basic and, from measurements on the Fedorov stage, th average corresponds to $Ab_{10}An_{90}$. It is very fresh and occurs in the form of lar broad prismatic crystals. It is twinned according to the Carlsbad, albite, an pericline laws. Zoning is not marked.

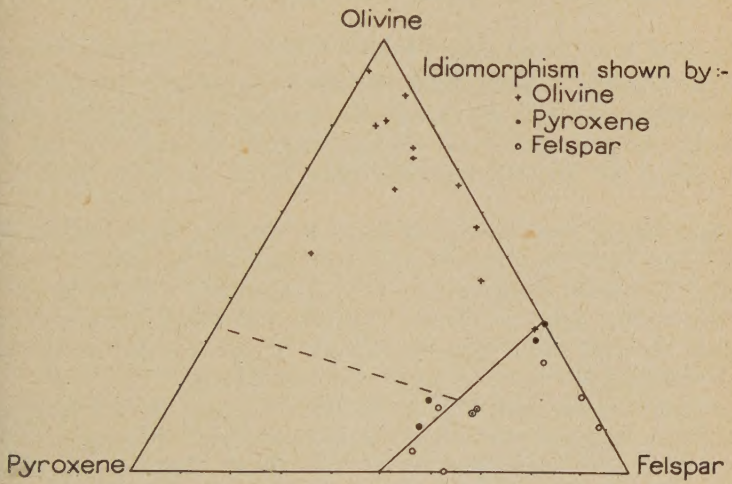
The pyroxene is also very fresh. From measurements on the Fedorov sta (2V 58°, $\gamma : c = 42°$) it appears to be a diopsidic augite. Diallage lamination an schiller structure, as described by Judd, are frequently found in this pyroxen In the ultrabasic rocks pyroxene is always ophitic both to olivine and felspa Orthorhombic pyroxene, probably enstatite, is found occasionally in these rock

The iron-ore, in the form of polyhedral grains, is probably magnetite an chromite. The ore is always enclosed in the other minerals and this suggests a early crystallization. Mesostasis and apatite are completely absent in the rocks.

Probably the most interesting feature of this series of rocks is the mutu relation between olivine and plagioclase. On the basis of modal analyses it possible to draw a line separating rocks with idiomorphic olivine from those wit ophitic olivine. It lies at olivine (25 Fa, 75 Fo) 35% and felspar ($Ab_{10}An_{90}$) 65 (fig. 3). This interesting feature was well described by Harker (7, pp. 85–87, fig. 25 who suggested that the order of crystallization of these two minerals depends their eutectic proportions. It is interesting to note that a similar conclusio expressed in a different form was reached previously by Geikie and Teall in the

dy of banded gabbros. Speaking of the mutual relations between pyroxene l labradorite in the gabbro, they wrote: 'Where the felspar is most abundant, re the idiomorphism is most pronounced, and where it is least abundant it is ulded on the other constituents and shows no trace of crystalline form' p. 651).

Both peridotite and allivalite contain angular xenoliths and schlieren. In idotite the common type of xenolith is a granular labradorite-pyroxene-rock n containing large phenocrysts of labradorite. This type of rock has a certain mblance to beerbachite and may represent thermally metamorphosed frag-



3. Triangular diagram showing the individualization fields of olivine, felspar, and pyroxene in the ultrabasic and basic rocks shown in fig. 2.

nts of porphyritic basalt or dolerite perhaps belonging to the plateau lavas. idotite also encloses in places angular xenoliths of more or less identical idotite and schlieren of dunite. On the south slope of Barkeval I have also nd peridotite enclosing angular xenoliths of allivalite. Xenoliths of peridotite also found in allivalite, and on the eastern slope of Hallival I have seen eral drawn-out fragments of a pure plagioclase-rock (anorthitite) enclosed llivalite.

Harrisite, the third member of the ultrabasic complex, represents the latest usion of the ultrabasic magma. It was apparently intruded as a banded sheet the peridotite in the western part of the complex and its junction with idotite is marked by an igneous breccia (7, p. 77). Harrisite is a very coarse composed mainly of olivine and basic plagioclase. According to Harker, in a ical harrisite olivine preponderates over anorthite, and the more felspathic ieties of this rock are called by him anorthite-peridotite. In my opinion this name is unnecessary, as harrisite can be made to include all the varieties of rse olivine-anorthite-rock. My impression is that harrisite differs only in the rseness of its texture from rocks of the peridotite-allivalite series and that it n fact a pegmatitic equivalent of these rocks.

The olivine in harrisite usually occurs in the form of platy crystals or pla crystal-groups, often in a parallel or slightly radiating arrangement. It is usua quite fresh and has a good (010) cleavage. Its colour is dark green or black. Ve often olivine plates enclose a central plate of anorthite or even a number of su plates in a sort of pegmatitic intergrowth (pl. XII, fig. 5). Anorthite in this ro varies in its degree of freshness. Besides olivine and anorthite small amounts pyroxene and iron-ore are also present. Harrisite is an extremely variable rock in composition, texture, and degree of alteration. Probably it represents a fr intrusion of a more fluid, volatile-rich residual fraction of the ultrabasic mag

IV. *The basic rocks.*

The basic plutonic rocks of Rum are mainly represented by eucrite. T eucrite found in the northern and eastern part of the intrusive complex is a mas medium-grained gabbroidal rock without marked banding. In the sout western part of the complex, especially near Harris, eucrite is most strong banded.

The name eucrite (from the Greek εὐκρῖτος, meaning easily discerned) w originally given by G. Rose in 1864 to a stony meteorite composed of anorth and augite. In 1872 P. Öberg applied the name eucrite to a terrestrial rock of similar composition found in Sweden. According to Öberg and other Swedi petrologists the type eucrite does not contain olivine, and the olivine-bearin variety is distinguished under the name of olivine-eucrite.

Olivine-eucrite is the basic rock predominant in Rum. It is a fairly coar gabbroidal rock composed of anorthite, clinopyroxene, and olivine, with accesso iron-ore and occasional orthopyroxene (pl. XII, fig. 6). Eight samples of eucri from various localities were measured on the Shand stage and averaged (table The dominant type of eucrite has a moderate amount of olivine, but in the regi of Harris olivine-rich bands and schlieren approaching pyroxene-peridotite a very abundant (table II). Olivine-rich eucrite is rather variable both in textu and in the degree of alteration. Some olivine-rich varieties contain platy olivin intergrown with anorthite after the manner of harrisite.

TABLE II. Modal composition of olivine-rich eucrite (Harris) and quartz-biotite-gabb (Papadil) expressed in weight per cent.

	Olivine-rich eucrite.	Quartz-biotite-gabbro.		Olivine-rich eucrite.	Quartz-biotit gabbro.
Olivine ...	57·70	—	Iron-ore ...	3·10	6·95
Pyroxene ...	8·60	25·55	Apatite ...	—	0·30
Hornblende	3·15	17·80	Serpentine mesostasis	14·15	—
Biotite ...	—	4·70	*L*	0·377	0·322
Felspar ...	13·30	41·45	Sp. gr. ...	3·162	2·833
Quartz ...	—	3·25			

From a distance the strongly banded eucrite of Harris looks like a well-band sedimentary rock. It is composed of alternating bands 2–5 feet in thickness of normal eucrite and a very coarse eucrite with long curving blades of pyroxe projecting from the margins inwards like tufts of grass. This coarse eucrite

.lly much more altered than the normal eucrite—the felspar is saussuritized the pyroxene partly altered to hornblende. The junction between the bands arp but gradational, and the crystals at the junction are intimately interlocked. lets of the coarse eucrite often penetrate into the bands of normal eucrite some even pass from one coarse band to another, cutting the normal eucrite ls in a zigzag fashion. Some junctions, however, are gradational over an or two and also indefinitely outlined nests of coarse rock are found in the nal eucrite.

ıe coarse rock may be called eucrite-pegmatite. In type and in its mode of rrence it resembles dolerite-pegmatite found in the Whin Sill and in other sills.

ıe banded eucrite was probably formed from a flow-banded heterogeneous ma, the two fractions of which differed both in composition and in the degree uidity. The most fluid fraction, which gave rise to eucrite-pegmatite, was ably solidified last, and this would explain the intrusive veinlets. The intense eric alterations of the eucrite-pegmatite were probably due to the hydrous re of the magma.

arker mentions the occurrence of subordinate masses of gabbro in Rum . 96), but whether these are separate intrusions or differentiated portions of ite is not definitely established. I have found quartz-biotite-gabbro only in locality, namely on the shore at Papadil (table II). The relation of this rock ıe eucrite found farther to the north could not be determined, it may, after ›e a separate intrusion. The quartz-biotite-gabbro consists of hypidiomorphic ıdorite, hypidiomorphic pyroxene partly altered to hornblende, iron-ore in ringed by biotite, allotriomorphic quartz, and apatite. It is rather difficult nagine such a type of rock being genetically connected with eucrite.

V. *The junction of granophyre with eucrite.*

ıe shore near Harris offers a number of excellent exposures of granophyre-ite junction. This junction is apparently vertical, but the granophyre sends horizontal tongues among the bands of eucrite. In places the eucrite along junction is shattered and penetrated by numerous ramifying veinlets of ophyre. The granophyre situated at a good distance from the junction ists almost entirely of a micrographic intergrowth of quartz and alkali-ar. The junction between granophyre and eucrite is distinct, but not marked very sharp line. The granularity of both rocks remains unchanged at the tion. A few feet from the junction the granophyre assumes a spotted aspect. is due to the incoming of hornblende in small clusters. Nearer the junction xene makes its appearance, quartz is gradually reduced in amount, and alkali-ar makes way to plagioclase. The contact eucrite is not much modified ›nd a certain uralitization of the pyroxene and increased serpentinization of ne. In some olivine-rich bands of eucrite olivine occurs in the form of large ›s and encloses anorthite, but this may be an original feature of the rock and a feature due to contact metamorphism.

number of basalt dikes cut through the granophyre and eucrite across the tion. They dip in various directions, intersect each other and thin out, some ıe upward and some in the downward direction.

VI. *Conclusions.*

The Tertiary plutonic rocks of the Isle of Rum consist of (1) an ultraba peridotite-allivalite banded complex, intruded by (2) olivine-eucrite, and an adjoining granophyre of a later period. The results outlined in this p are based on twenty-six modal analyses of peridotite, allivalite, and euc These analyses give an adequate picture of the composition range of the ro in question. The ultrabasic rocks comprise a continuous peridotite-alliv series and an analogous parallel series is provided by olivine-eucrite (fig. In their composition as well as in the field relations these two series are q distinct.

The order of crystallization of minerals in the ultrabasic rocks was appare conditioned by the composition of the initial magma-fractions. In the mel cratic fraction olivine began and finished to crystallize first, in the leucocrati plagioclase. The early crystallization products of these magma-fractions a represented by dunite and anorthitite schlieren and inclusions. The orde crystallization of these two minerals is admirably exhibited by their textu relations. In olivine-rich members of the ultrabasic series olivine is idiomorp while in the plagioclase-rich members olivine is ophitic to plagioclase. It w suggested by Harker that the degree of idiomorphism of these two minerals m have been determined by their eutectic proportions. From the modal analy the line separating the field of idiomorphic olivine from idiomorphic plagiocla can be fixed at olivine 35%, plagioclase 65%. Applying a similar method, t individualization fields for all the three principal minerals—olivine, plagiocla and pyroxene—can also be tentatively attempted, but with a lesser degree certainty. According to Vogt (11) and Bowen (3) the eutectic proportion betwe pyroxene and bytownite is 50 : 50 and this proportion fits well into the triangul diagram (fig. 3) in which the boundary line of the felspar field can be drawn fr olivine 35 : felspar 65 to pyroxene 50 : felspar 50. The boundary between pyroxe and olivine is more difficult to establish, because of the absence of correspondi rocks. According to Bowen (3) the eutectic between diopside and forsterite is 87 : 13, while according to Vogt this proportion is nearer to 67 : 33. In vie of this uncertainty, which is obviously due to the variability in compositi of the two components, the boundary line of the pyroxene field is drawn co jecturally on the diagram (fig. 3). The modal analyses of the Swedish eucrit and allivalites, as given by Du Rietz (4) and Lundegårdh (8), seem to fall we into this diagram.

The suggested eutectic between olivine and plagioclase is based entirely on t study of the textural relations of these two minerals in the rocks of the peridotit allivalite series. In his study of the ternary system anorthite-forsterite-silic Andersen (1) found that in the binary system anorthite-forsterite the eutectic not present and the field of magnesium-spinel intervenes between the fields olivine and plagioclase. A small increase in silica in the ternary system, howeve brings into existence a cotectic line between forsterite and anorthite. A dire application of Andersen's results cannot be made to the ultrabasic series of Ru for the simple reason that the two minerals in question are not the pure forsteri and anorthite, but olivine (25 Fa, 75 Fo) and plagioclase ($Ab_{10}An_{90}$), and therefo the possibility of a eutectic is not excluded.

lthough the highly controversial problem of banding in igneous rocks cannot iscussed here, as it would involve the consideration of many banded complexes ı as the Bushveld complex, the Skaergaard complex (12), and many others, e conclusions may be outlined regarding the banded rocks of Rum. Of the e principal hypotheses, among many others, applied to the origin of banded ous rocks, namely (1) intrusion of a previously differentiated heterogeneous ma, (2) post-emplacement differentiation in situ, and (3) intrusion of separate mas, the facts alluded to in this paper favour the application of the first hese hypotheses. The origin of the banded olivine-eucrite cannot, in my ion, be explained by any other hypothesis, but the banded ultrabasic complex ents a much more difficult problem. On the one hand, we have here, especially he transition zones between peridotite and allivalite, well-marked fluidal cture, with contorted bands and streaks, so strikingly illustrating a simul- ous intrusion of a heterogeneous magma (fig. 1). On the other hand, we have evidence of xenoliths, which suggests that at least some of the rocks were lified before the final emplacement of the magma as a whole. In their study ıe Tertiary banded gabbros of Skye, Geikie and Teall have suggested that the ling was produced by the intrusion of a heterogeneous magma (5). Harker, he other hand, applied this hypothesis only in the case of minor banding in the larger sheets (6, p. 75; 7, p. 74), suggesting that the larger sheets them- es represented distinct intrusions of different magmas which 'followed one her very closely, with intervals scarcely sufficient for the consolidation of sheet before the next one succeeded it' (7, p. 74). Such a double hypothesis ı my opinion, unnecessary, as a single hypothesis—the intrusion of a hetero- ous magma—is quite sufficient to explain all the observed facts. An attempt xplain such intratelluric differentiation is quite outside the present field of iry. One can only assume that during the process of intrusion the magma- ions were drawn out together into flow-layers which did not mix because of ighly viscous nature of the magma which was near or at the point of crystal- ion. Such a crystallization began probably before the final emplacement of nagma, and the products of this early crystallization—dunite and anorthitite, even later products, peridotite and allivalite—were torn away by a still ile magma and incorporated in it in the form of schlieren and xenoliths. Such ıenomenon is well known among many igneous rocks under the name of brecciation.

ıere is, however, a certain parallelism between the mechanism of differentia- in the ultrabasic and basic magmas—both of them show a tendency to rate into two fractions. As to the relation between the ultrabasic and the magmas, the rock assemblage found on Rum does not provide an answer. ıe Swedish localities described by Du Rietz (4) and Lundegårdh (8), perido- allivalite, and eucrite apparently form a closely intermixed complex and are r derived from a common magma or are products of intermixing of magmas ved from different crustal layers. The present study of the ultrabasic and plutonic rocks of Rum suggests no more than that these were probably ed by the consolidation of fluidally arranged heterogeneous magmas, the two basic magmatic fractions appearing as olivine-rich and plagioclase-rich ls, while in the basic magma the differentiation gave rise to volatile-rich and tile-poor bands.

VII. *List of works to which reference is made.*

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Explanation of Plate XII.

Ordinary light. ×4. L = average granularity of the rock in mm.

Fig. 1. Peridotite, Abhuinn Rangail, NE. of Harris. A very coarse rock with rounded idio morphic crystals of olivine, set in ophitic plagioclase. (L = 0·957.)

Fig. 2. Junction of allivalite (upper part) with peridotite (lower part). NE. shoulder o Hallival. The transition between the two rocks is sharp but gradational. The olivine ophitic to plagioclase in the allivalite and idiomorphic in the peridotite.

Fig. 3. Allivalite, east slope of Hallival. An olivine-rich variety of allivalite with idiomorphi and hypidiomorphic olivine. (L = 0·589.)

Fig. 4. Allivalite, north of Hallival. A plagioclase-rich variety of allivalite with ophiti olivine. (L = 0·422.)

Fig. 5. Harrisite, one mile north of Harris. The photograph shows only a small portion o large crystals of olivine set in plexus of plagioclase laths. In the left bottom corner is see a composite crystal of olivine enclosing plagioclase.

Fig. 6. Eucrite, Allt na h'Uamha, north of Hallival. This rock is composed of plagioclas laths, ophitic pyroxene, ophitic olivine, and a small amount of ore. (L = 0·322.)

Note on the method of photomicrography.

All the photomicrographs reproduced in this plate have been taken without the help microscope and camera. This method consists in printing contact negatives directly from th rock sections on a 'positive' cine-film. The negatives thus obtained are then placed in a ordinary enlarger and enlarged prints are obtained. The whole process, apart from the tim taken in drying the negatives and the positives, takes only a few minutes per section. Onl coarse-grained and medium-grained rocks can be photographed in this way. The enlargemen as a rule, cannot exceed ×15 linear without losing in definition. The advantage of thi method, besides economy both in time and money, is the large field which can be obtained b using low magnification.

Electrodialysis of mineral silicates: an experimental study of rock-weathering.

(With Plate XIII.)

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[Read March 22, 1945.]

Introduction.

)ALMER'S investigation of the chemical and mineralogical aspects of soil-forming processes was restricted to comparative chemical analyses of the thered shells and the essentially unaltered cores of certain spheroidal basic ders from Wahiawa in the Hawaiian Islands.[1]

he present writer describes an experimental approach to the general problem ock-weathering on lines suggested by Dr. A. Brammall:[2]

) Electrodialysis of eight typical rock-forming mineral silicates, each of which dialysed separately after having been ground to an impalpable powder and ysed in detail.

) Assessment of the effect of dialysis by comparing the composition of the tered mineral with that of the slime left in the mineral-chamber when ysis was virtually at an end.

) X-ray and kathode-ray tests on three of these minerals and the correspond-limes,[3] to ascertain whether colloidal end-products associated with, or coating, icles of unaltered mineral had integrated to form one or other of the specific stalline colloids' identifiable in soils and clays.[4]

ie eight minerals electrodialysed are named, and their chemical composition ven, in table I. As one of the main purposes of this experimental work is to ct attention to the character of the mineral change induced by electrodialysis, titutional formulae corresponding to the analyses given in table I are set out ble II, and supplemented by partial analyses of the slimes collected (table III). analytical data (tables I and III) were kindly placed at the writer's disposal)r. Brammall, who also selected the minerals to be treated and directed the se of the experiments.

I. S. Palmer, Soil Sci., 1931, vol. 31, pp. 253–265.

. Brammall and J. G. C. Leech, Sci. Journ. Roy. Coll. Sci. London, 1943, vol. 13, pp. 3.

'or reasons directly due to war-time conditions, the number of minerals and slimes itted for these tests had to be reduced to the bare minimum. X-ray test-work was d out on only two minerals (orthoclase and hornblende) and the corresponding slimes. ode-ray tests could be done only on pargasite and the corresponding slime.

. B. Hendricks and W. H. Fry, Soil Sci., 1930, vol. 29, p. 457; W. P. Kelley, W. H. Dore, . M. Brown, ibid., 1931, vol. 31, p. 25; G. Nagelschmidt, A. D. Desai, and A. Muir, Journ. . Sci., 1940, vol. 30, p. 663.

X-ray test-work was done by Mr. F. A. Bannister and Dr. Brian Mason, in t Mineral Department of the British Museum; electron-diffraction tests by W. W. G. H. Robins and his colleagues of the Chemical Technology Departme Imperial College, London.

Description of experimental work.

Each mineral, or carefully separated mineral aggregate, was ground in an ag mortar. A visual estimate made by aid of the microscope showed that 70–80% the particles had a maximum diameter of 3 μ.

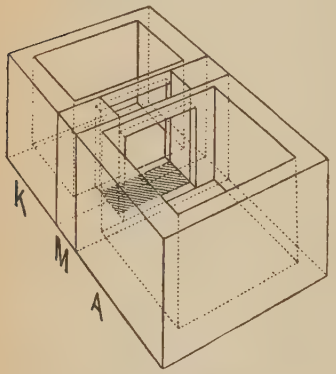


Fig. 1. The electrodialyser.

The electrodialyser used was designed a constructed by Dr. Henn Collins (of Imperial College), who found 'perspex' p ferable to frame-work materials used in earl patterns devised by Mr. J. G. C. Leech. consists of three cells or chambers, each bui up of shaped 'perspex' slabs, which are he in position between two sheets of wood (n shown in fig. 1), clamped by bolts. The miner chamber (M) is separated from the anod chamber (A) and the kathode-chamber (K) b cellophane. The shaded area represents th floor of the mineral-chamber (M). The cell phane sheet used is the grade '300 PT, u coated'—obtainable directly from the manu facturers (British Cellophane Co., Bridgwater It must be sluiced with distilled water for at least twenty minutes before use, i order to eliminate possible traces of sodium silicate.

The apparatus was set up in a dust-proof, reasonably air-tight chamber with glass wall. The inside temperature of this chamber was kept constant at 28° C by an appropriate thermostat. The dialyser was filled with distilled water, 50 c.c in the mineral-chamber, and, in the two others, sufficient to maintain the sam water-level in all three chambers. An accurately weighed amount of mineral powder (about 1 gr.) was transferred to the mineral-chamber, into which CO_2-ga was continuously bubbled. This gas-current was brisk enough to keep the mineral powder in a state of constant motion. Splash was prevented by a lid of 'perspex fixed above the mineral-chamber. With the exception of a thermometer suspende in the anode-chamber, glass-ware formed no part of the apparatus. Coiled platinu wires formed the electrodes.

During electrodialysis, certain kations, notably K^+, Na^+, Ca^{++}, Fe^{++}, and Mg^{++} migrate from the mineral-chamber to the kathode; whereas the silicon-ion doe not pass through the cellophane partition. A blank experiment established th fact that essentially the whole of the anodic products, comprising hydrated silica alumina, and ferric oxide, remained with the residual material in the mineral chamber.[1]

[1] Analysis of kathode-chamber products showed that a relatively small amount of aluminiu did pass through the cellophane partition into the kathode-chamber.

TABLE I. Chemical analyses of fresh minerals.

	A. Olivine.	B. Augite.	C. Horn-blende.	D. Par-gasite.	E. Biotite.	F. Clino-chlore.	G. Musco-vite.	H. Orthoclase.
...	40·85	49·23	42·70	42·09	38·04	30·03	44·68	64·40
...	0·03	1·57	1·40	0·68	0·39	trace	0·70	0·01
...	0·74	5·68	10·25	13·60	15·77	18·07	31·80	19·41
...	1·47	2·45	5·61	2·06	2·62	1·87	4·49	0·02
...	5·74	2·91	13·78	5·45	11·13	1·62	0·84	—
...	0·09	0·15	0·55	0·07	0·10	0·02	0·04	—
...	50·31	15·22	9·18	16·16	18·35	33·51	1·30	—
...	0·16	22·19	11·88	13·40	0·91	0·03	0·52	0·14
...	—	0·26	1·22	2·16	0·27	nil	0·79	2·30
...	—	0·18	1·19	1·43	9·23	nil	10·48	13·26
...	—	—	0·10	trace	0·33	trace	0·01	—
...	—	—	0·06	0·30	nil	0·07	nil	—
...	—	—	0·05	—	—	—	—	—
...	—	—	0·01	0·01	0·15	nil	0·23	—
...	—	—	nil	nil	0·01	nil	0·04	—
...	—	—	—	—	trace	—	nil	—
...	—	—	—	—	0·02	0·98	—	—
...	—	—	nil	0·02	0·01	0·004	—	—
...	—	—	—	—	0·03	0·24	—	—
...	—	—	—	—	—	—	—	—
...	—	—	0·002	—	0·09	—	—	—
...	—	—	—	trace	—	—	—	—
...	—	—	—	2·65	0·26	0·02	0·11	—
+ ...	0·41	0·26	2·33	0·82	2·24	13·30	3·50	0·20
− ...	0·06	0·18	nil	0·04	0·20	0·48	0·28	0·06
...	99·86	100·28	100·312	100·94	100·15	100·244	99·81	99·80
O ...	—	—	0·03	1·12	0·11	0·01	0·04	—
	99·86	100·28	100·282	99·82	100·04	100·234	99·77	99·80

Olivine, separated from dunite, North Carolina, U.S.A. B, Augite, Puy-de-Dôme, France. astingsitic hornblende, County quarry, Malvern, Worcestershire. D, Pargasite, Finland. reen-brown biotite, separated from granite pegmatite, Tollgate quarry, Malvern. F, chlore, West Chester, Pennsylvania, U.S.A. G, Muscovite, separated from granite natite, Tollgate quarry, Malvern. H, Clear, transparent orthoclase, locality unknown.

nalysts: A, B, C, and H, Geochemical Laboratories, London; D and F, Mr. W. J. Dunstall; d G, Dr. A. W. Groves.

will be observed that the selected mineral suite ranges from the (SiO_4)-class to the $_{10})$- and (SiO_2)-classes of crystal-structure and is therefore fairly representative of minerals nt in rock families ranging from basic to acid.

Time-current (T-C) and time-temperature (T-t) curves.

eadings of current-strength and cell-temperature were recorded and *T-C* and curves were plotted, in order to determine when dialysis was virtually at an *T-t* curves are omitted in this paper, as they are not entirely relevant in practical determination of the virtual end-point of dialysis.

ormally, when a solute is electrolyzed under uniform conditions (of tempera-, voltage, &c.) the current should rise continuously until a maximum is hed; thereafter, the current should decrease and eventually reach a constant imum. Theoretically, this minimum should correspond with that of distilled

TABLE II. Constitutional formulae of minerals listed in table I, calculated, from the analy to the basis, (O,OH,F) = (x), which is given at the foot of this table.

	Olivine.	Augite.	Horn-blende.	Par-gasite.	Biotite.	Clino-chlore.	Musco-vite.	Felspar
Group A:								
Si	0·98	2·09	6·41	6·16	5·74	5·66	6·15	$K(Si_3Al)O$
Al	0·02	—	1·59	1·84	2·26	2·34	1·85	78·6%
								$Na(Si_3Al)$
Al	—	0·28	0·23	0·50	0·55	1·67	3·31	20·7%
Fe‴	0·03	0·08	0·63	0·23	0·30	0·26	0·46	$Ca(Si_2Al_2)$
Fe″	0·12	0·10	1·72	0·67	1·41	0·26	0·10	0·7%
Mn	negl.	negl.	0·07	negl.	0·01	negl.	negl.	Total 100·0
Mg	1·80	1·01	2·05	3·52	4·13	9·39	0·27	
Ca	negl.	0·01	1·88	2·04	0·08	negl.	0·07	
Ti	negl.	0·05	0·16	0·08	0·04	—	0·07	
Na	—	0·02	0·36	0·61	0·08	—	0·21	
K	—	negl.	0·23	0·27	1·78	—	1·84	
Ba	—	—	—	negl.	negl.	—	0·01	
Sr	—	—	—	—	negl.	—	negl.	
V	—	—	—	negl.	negl.	—	—	
Cr	—	—	—	—	negl.	0·15	—	
Ni	—	—	—	—	negl.	0·04	—	
Cu	—	—	—	—	negl.	—	—	
Group B:								
O	3·93	5·93	21·67	21·98	21·62	19·28	20·74	essentially
OH	0·07	0·07	2·33	1·22	2·25	16·71	3·21	unaltered
F	—	—	—	0·80	0·12	0·01	0·05	anhydrou
x	4	6	24	24	24	36	24	8
+charges	791	1190	4566	4601	4557	5528	4469	—
−charges	793	1193	4567	4598	4561	5528	4474	—

On a valency basis, the total 'positive' charge, assessed on the values given for constituen acknowledged in Group A, should exactly balance the total 'negative' charge assessed fro constituents in Group B. But as the present purpose is to call attention to the disturbance this balanced condition by the leaching of the more important units in Group A, all valu below 0·01 are omitted as being 'negligible'. These omissions have a negligible effect, as show at the foot of the table.

water electrolyzed under the same conditions. Silicates, however, are unlikel to behave as simple 'solutes' in the same sense as common salt for example; bu in general, the graphs (figs. 2 and 3) show the characteristics theoretically expecte for such solutes. Electrodialysis was stopped, and the products were collecte when the T-C curve remained essentially horizontal at minimum current-strengt (fig. 3).

The period for one continuous dialysis was 24 hours. Current-strength an cell-temperature were recorded at intervals of ten minutes from the start of th operation until maxima were passed. It was found that, in general, both th current and the temperature first rose, then fell to almost constant minima afte 7–8 hours from the start of the operation. Thereafter, further recording was con sidered to be unnecessary; but dialysis was continued for the full period o 24 hours. The circuit was then temporarily broken, while products were collecte from the kathode-chamber and anode-chamber. The T-C graphs obtained in thi first operation will be termed the 'primary graphs' (fig. 2).

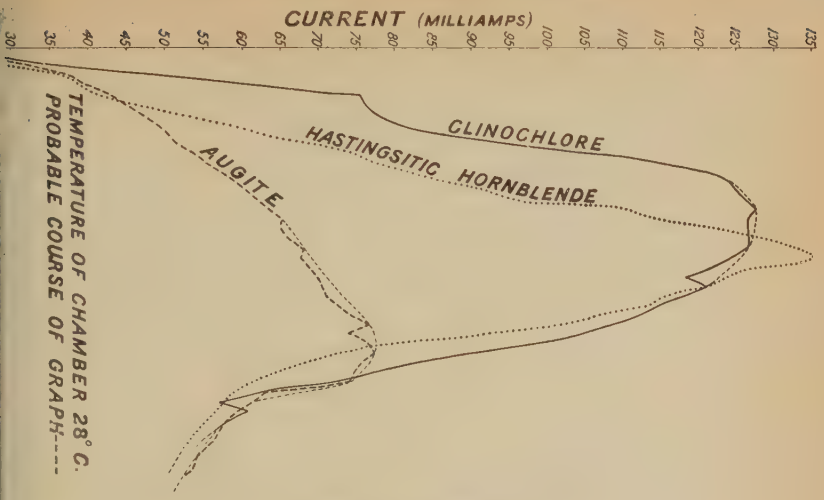

CURRENT (MILLIAMPS)
30 35 40 45 50 55 60 65 70 75 80 85 90 95 100 105 110 115 120 125 130 135
TEMPERATURE OF CHAMBER 28° C.
PROBABLE COURSE OF GRAPH----
CLINOCHLORE
HASTINGSITIC HORNBLENDE
AUGITE

Fig. 2. Primary time-current graphs.

fresh supply of distilled water was then put into each of the three cells—to amount required to attain the original level, and dialysis was repeated for her 24 hours. As before, current and temperature were recorded for the first hours, in order to determine whether 'maxima' were attained as in the case ıe primary graphs. The graphs for the second operation will be termed the ɔndary graphs' (fig. 3). The form of the secondary *T-C* graphs agrees very ·ly with that for distilled water, except that the latter has slightly lower es. Thus, at the end of the second full-period operation, the anode and kathode ucts could warrantably be collected, as 'end' products. The 'primaries' and ɔndaries' for augite, hastingsitic hornblende, and clinochlore are shown—as g typical of the whole.

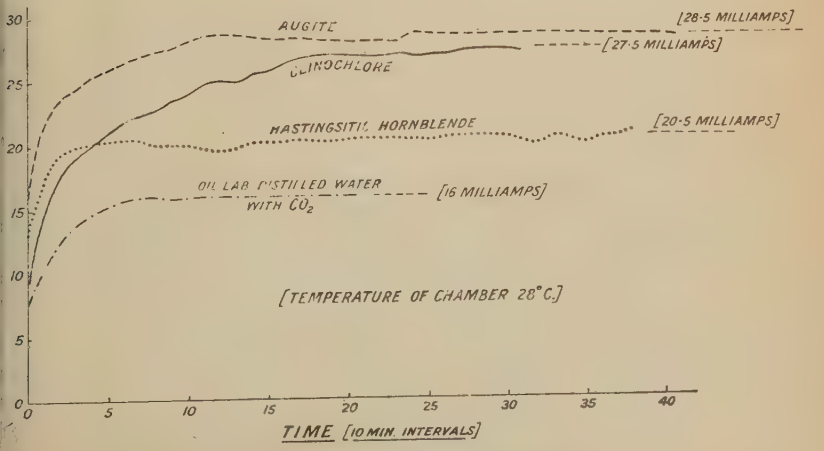


Fig. 3. Secondary time-current graphs.

Treatment of the kathode-chamber slime.

The slime collected from the mineral-chamber was stored in wax-lined bott
The kathode-chamber slime was evaporated to dryness on a dust-proof wa
bath, and the solid residue was partially analysed (table III). As the
kathode-chamber liquid collected ranged between 500 and 700 c.c., evaporatio
so large a bulk was a long process, and special precautions were necessary

TABLE III. Analyses of suspensoid slimes. Analyst: Dr. A. J. C. Welch.

	Olivine.	Augite.	Horn-blende.	Par-gasite.	Biotite.	Chlorite.	Musco-vite.	Felspa
SiO_2 ...	43·26	47·58	38·80	40·70	35·34	29·98	39·85	65·03
R_2O_3 ...	9·50	12·18	30·20	21·80	26·47	21·04	32·85	16·66
H_2O+ ...	2·28	3·63	9·58	5·69	19·02	17·78	>12·20 <15·19	2·38

prevent contamination of the solid residue by air-borne dust: a convex wa
glass was hung from a support in such a manner that, while it covered t
evaporating-dish without touching either the dish or the bath, the rim of t
watch-glass was below that of the dish. Hence, water condensed on the inside
the watch-glass trickled down to the rim and fell outside the basin. The wh
apparatus was installed in a fume-cupboard from which air, together with du
suspensions, was continuously exhausted during the whole period of evaporatio

Discussion of the data. Evidence for hydration.

Comparison of tables I and III shows that emphatic hydration of all the miner
occurs during the process of electrodialysis. The degree of hydration induc
under the experimental conditions described is assessed in table IV, which sho
a maximum for augite and felspar (notoriously unstable under natural weatheri
conditions), and a minimum for chlorite (one of the more stable rock-formi

TABLE IV. Per cent. water-content above 105–110° C., in (*a*) the initial mineral and (*b*) t
suspensoid slime.

	Olivine.	Augite.	Horn-blende.	Par-gasite.	Biotite.	Chlorite.	Musco-vite.	Felspar
(*a*) ...	0·41	0·26	2·33	0·84	2·24	13·30	3·50	0·20
(*b*) ...	2·28	3·63	9·58	5·69	19·02	17·78	> 12·20 < 15·19	2·38
Per cent. increase of H_2O	456·1	1296·1	331·1	577·3	749·1	33·7	>248·6 <334·0	1090·0

minerals). As already mentioned (p. 138), this hydration is accompanied by t
production of colloidal silica, alumina, and ferric oxide, and the extraction
bases, particularly those which yield soluble carbonates or bicarbonates. It
warrantable to suggest that, taken together, these 'alterations' imply so
drastic change in the crystal-structure of the original minerals: their init
geometry—maintained by the orderly packing of 'positively' and 'negativel
charged elements, in consistently regular co-ordination—must be partially,
completely, destroyed.

Under natural weathering conditions, the collapse of the initial lattice-structu
may be less abrupt than the experimental data suggest: it may proceed by stag

s in the micas, two species of which were included in the list of minerals treated. dromuscovite, for example,[1] is characterized by (*a*) deficiency of alkalis and excess of $(OH)^-$—as opposed to O^{--}. The suggestion here is that the extraction K^+ and Na^+ may be accompanied by a corresponding reduction of O^{--} to $(H)^-$ while the initial structure persists—within limits which may be vaguely ned as 'the range of tolerance'. Hydrobiotites may lend themselves to a ilar explanation. One object of these experiments was to determine, if possible, ther analogues of these 'hydromicas', e.g. layer-lattice minerals included in 'clay' species, could be detected by X-ray or kathode-ray technique among dialysed products of mineral silicates presumed to yield such species under ural weathering conditions.

Investigation by X-ray technique.

he principles of sedimentation under the influence of gravity and in accordance n Stoke's law were applied to obtain from the slimes collected two fractions, e' and 'coarse'. The 'fine' fraction contained mineral particles below 3 μ neter; the 'coarse' fraction represented the average grade for the slime as a le.

late XIII, figs. 1–3, shows X-ray diffraction-patterns of the fine and coarse tions of dialysed orthoclase and of the untreated mineral. The three patterns apparently identical: they show the same number of lines, the same relative nsities, and the same spacing between any two corresponding lines. This cordance would appear, at first sight, somewhat discouraging: it suggests er (*a*) that products allied to the 'clay' species were absent from the slimes, *b*) that the quantity of such products was too minute to be effectively con- rated by the method adopted, and too small for detection by X-ray technique, ne presence of preponderant particles of unaltered mineral. It should be stated, ever, that the fractionation of the suspensoid slime was based on the assump- that any particulate 'crystalline colloids' produced would be unlikely to esce in liquid being continuously freed from positively charged ions and kept onstant agitation. In the writer's opinion, the presence of such crystalline oids, as independent particles, is at least doubtful. Possibly the conditions of experiment hardly warrant the expectation, as will be pointed out in the cluding section of this paper. Similarly, negative results were obtained from ay work on hastingsitic hornblende and its two 'slime' fractions (pl. XIII, 4–6).

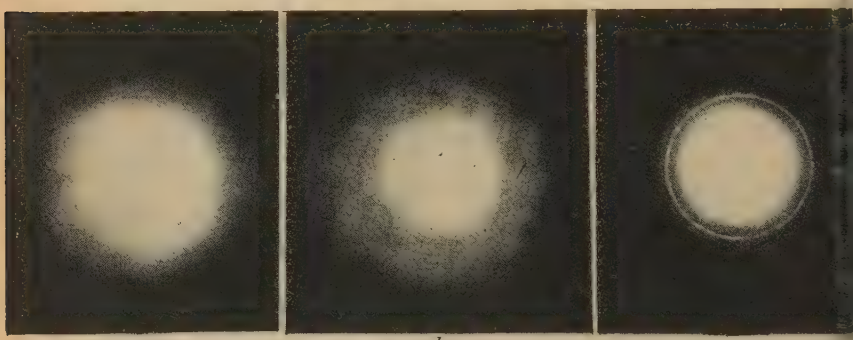
ere the results of X-ray test-work decisive on this matter, they would rule the further possibility that product-minerals may form a thin superficial layer ectively covering the particles of unaltered mineral. Here, however, the lts are not decisive. It is probable that structural changes may be restricted xceedingly thin superficial layers of the affected mineral particles. X-rays too highly penetrative to serve as a decisive weapon for the probing of this blem: experiment has shown that X-rays must pass through millions of lattice- es before they are appreciably absorbed.[2] Even under the most favourable litions, X-rays would give a pattern corresponding to the predominant

[1] A. Brammall, J. G. C. Leech, and F. A. Bannister, Min. Mag., 1937, vol. 24, pp. 507–510.
[2] W. H. Bragg and W. L. Bragg, X-rays and crystal structure, 1915, p. 14.

constituent for a depth of at least 10^5 Å. (= 0·01 mm.).[1] Films of such produ minerals (if they really arise under the experimental conditions described) a unlikely to be 0·01 mm. thick, because the mineral particles dialysed have average diameter of only 0·003 mm., i.e. 3 μ.

Investigation by electron-diffraction.

X-ray technique, applied to only two of the eight pairs of solids, having pro indecisive, facilities were obtained for test-work by kathode-ray technique on



a *b* *c*

Fig. 4. Kathode-ray transmission photographs (by W. G. H. Robins). (*a*) Pargasite, fres mineral. (*b*) Pargasite, dialysed slime. (*c*) Kaolinite.

selected pair. For this test the pargasite pair was submitted together wit kaolinite as a possible basis for comparison.

Initial experiments had shown that slime-particles approaching 4 μ in diamet were most likely to respond to the test, and the slime available was accordingl fractionated to meet this requirement.

Fig. 4 shows the transmission-patterns (powder photographs) for (*a*) unaltere pargasite, (*b*) dialysed pargasite, and (*c*) kaolinite. Between (*a*) and (*b*) there is noticeable difference—best observed in the original negatives. Unfortunately the patterns are not clear enough for exact measurements of the Kikuchi ring which are more numerous in the dialysed fraction (*b*) than in the unaltere pargasite. Mr. Robins's interpretation of the difference is that the slime particl 'contain on their surface a *microcrystalline*, non-orientated layer of materi which is not pargasite'. Thus there is warrant for entertaining the possibili that the particles of unaltered pargasite may be coated by a 'protective' film which may be 'colloidal' but is definitely 'crystalline'. Unfortunately, th limited amount of evidence obtainable did not warrant a more precise identifica tion, or even discussion of possible relationship to kaolinite—the only 'clay species tested.

Conclusions.

Short-period electrodialysis of the common rock-forming minerals selecte induced chemical changes which suggest partial or complete collapse

[1] B. Chalmers and A. G. Quarrell, The physical examination of metals, 1941, vol. 2, p 212–213.

stal-structures. Colloidal end-products identified include those which, under opriate natural conditions, could integrate to 'crystalline colloids' belonging the 'clay' species.

The indecisive character of the results obtained, in tentative test-work necesily restricted to the bare minimum, may be attributable to either (*a*) the atively small mass of residual colloid produced, i.e. the shallowness of the erficial layer actually dialysed, or (*b*) the fact that the time- and *TP*-factors erative during the consolidation and reconstitution of natural clayey sediment ld not be experimentally conditioned.

The large amount of water used in these experiments tends to maintain the orphous colloid state. Presumably, this excess of water must be removed if integration of these colloids to some specific crystalline species is to be expected. reover, some proportion of the excess (OH)-groups must also be removed by t, or by pressure, or by both, so that the Al- and Si-atoms can be brought hin effective range of each other and induced to combine chemically.

Removal of the excess of water is a simple matter: one merely filters it off, or noves it by centrifugation: but even the air-dried residue still contains an ess of water and/or (OH)-groups. The production of crystalline colloids is not ly to be conditioned merely by rapid heating, or even by heating at 'low' peratures—possibly much below 105° C.

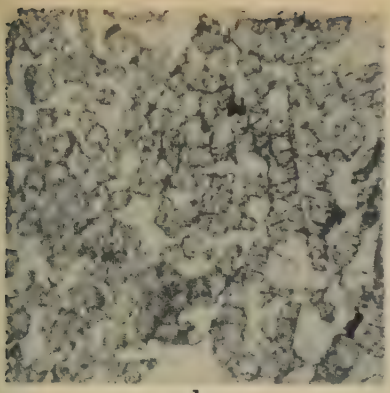
Considerations based on the environment in which 'crystalline colloids' occur nature, particularly in soils and stratiform clays, suggest that these crystalline lies arise by dehydration processes involving a very large time-factor, normal k-temperatures, and conditions of *gradually* increasing pressure such as would induced by slow burial of sediments beneath a gradually increasing load of later iments. These natural conditions seem to be expressed by the thermodynamic ation, $\Delta P \times \Delta V = \Delta T$, which relates both gradual increase of pressure and dual reduction of volume to modest increments of energy in the form of heat. erative over a long period.

The author makes grateful acknowledgement to Dr. A. Brammall, Mr. J. G. C. ech, Mr. F. A. Bannister, Dr. Brian Mason, and Mr. W. G. H. Robins for uable assistance particularized on pp. 137 and 138 of this paper.

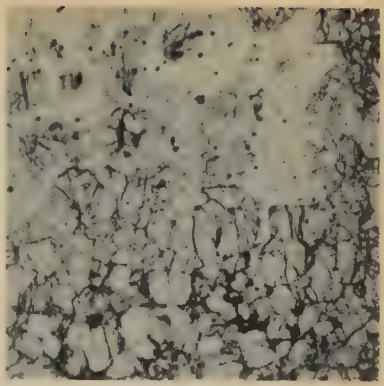
Explanation of Plate XIII.

X-ray powder photographs. Figs. 1–3 (Mr. F. A. Bannister and Dr. Brian Mason) taken with iltered copper-radiation, and figs. 4–6 (Mr. F. A. Bannister) taken with unfiltered iron-iation, in a cylindrical camera, diameter 6 cm.

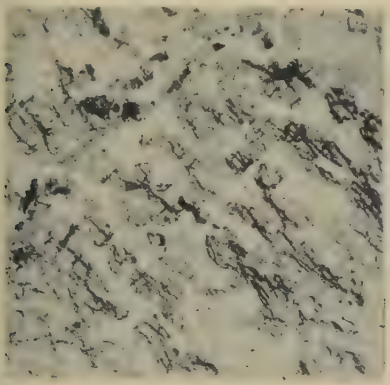
Fig. 1. Orthoclase, dialysed slime, fine fraction.
Fig. 2. „ „ coarse fraction.
Fig. 3. „ fresh mineral, locality unknown.
Fig. 4. Hastingsitic hornblende, dialysed slime, fine fraction.
Fig. 5. „ „ „ coarse fraction.
Fig. 6. „ „ fresh mineral, County quarry, Malvern, Worcestershire.



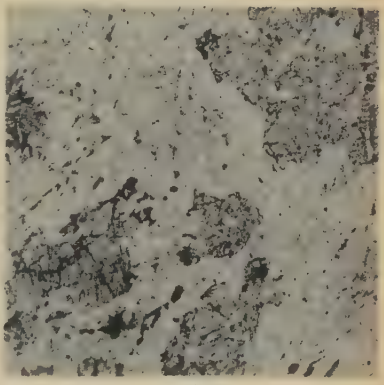
1



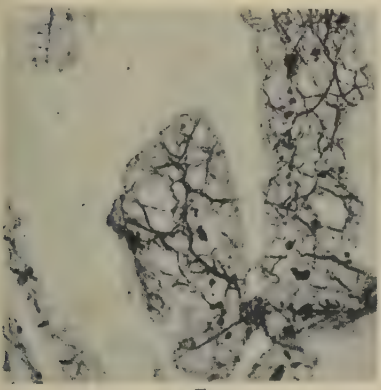
2



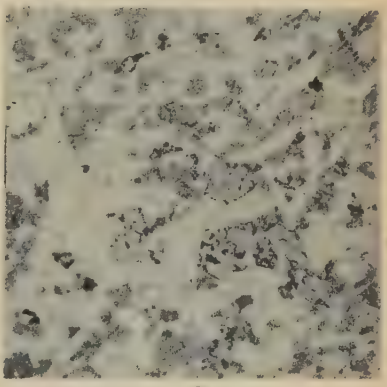
3



4



5



6

S. I. Tomkeieff: Rocks from Isle of Rum.

THA HLA: ELECTRODIALYSIS OF SILICATES

MINERALOGICAL ABSTRACTS

(Vol. 9, No. 8, December, 1945.)

Notices of Books

:SMAN (A. E.)(1883-1945) & BETEKHTIN (A. G.)] Ферсман (А. Е.) и Бетехтин (А. Г.), editors. Минералогия Урала. [*Mineralogy of the Urals.*] Moscow & Leningrad (Acad. Sci.), 1941, vol. 2, 414 pp., 81 pls. (unnumbered), many text-figs.

uring recent years extensive monographs have been issued on various sian minerals of economic importance (e.g. bauxite, clays, micas), and there been a few books on the mineralogy of certain districts (e.g. Crimea, Kola, an). But there has been no systematic descriptive mineralogy for the whole ıtry on the lines of Greg and Lettsom for the British Isles, Lacroix for France, others. N. I. Koksharov's 'Materialien zur Mineralogie Russlands' (11 vols., –94) was rather a collection of disjointed notes, mainly crystallographic; and work is quoted only twice in the several literature lists in the present volume. ıis vol. 2 deals with the native elements, sulphides, sulphosalts, and related erals. The accounts of each group or species have been contributed by rent authors (24 in all). The minerals dealt with are those of the Fe group ite, bobrovkite, awaruite), Pt group, Os-Ir group, Au group, Ag, Cu, As, Bi, Pb, Ta, diamond, graphite, sulphur; simple sulphides (realgar, orpiment, ıite, bismuthinite, chalcosine, argentite, covelline, blende, wurtzite, greenock- alabandine, pyrrhotine, troilite, millerite, pentlandite, cinnabar, galena, ybdenite); sulphoferrites and sulphocobaltites (chalcopyrite, bornite, cuban- linnaeite, polydymite, violarite); sulpharsenites (proustite, jordanite, selig- nite); sulphantimonites (pyrargyrite, jamesonite, boulangerite, bournonite); hobismutites (goongarrite, aikinite); mixed sulphosalts (tennantite-tetra- ite); sulpharsenates and sulphantimonates (enargite, famatinite, luzonite); rides (tetradymite, hessite, altaite); arsenides and antimonides (niccolite, hauptite); disulphides, sulpharsenides, sulphantimonides, and diarsenides ite, marcasite, melnikovite, laurite, cobaltite, gersdorffite, mispickel, glau- t, löllingite, smaltite-chloanthite). The essential characters of species are briefly stated with few chemical analyses and little crystallographic data. e figures of crystals are given listing the crystal-forms shown, but with no ement of the axial ratios. Many of the numerous figures are of polished ore imens, and the whole viewpoint is that of economic mineralogy rather than erely descriptive mineralogy. These figures are numbered separately for each ies; for example: in the platinum group, figs. 1–44, some of them on 10 plates; , figs. 1–46, some on 7 pls.; diamond, figs. 1–18, some on 3 pls. In addition to ndex of mineral names, there is a useful geographical index. L. J. S.

:SMAN (A. E.)] Ферсман (А. Е.). Воспоминания о камне. [*Reminiscences about stones.*] Popular Science Series, Acad. Sci. USSR, Moscow and Leningrad, 1945, 83 pp., 4 pls. Price 5 rub.

ıis attractive booklet (first and second editions 1940 and 1943) gives chatty unts of the author's varied experiences during his extensive travels in search inerals. Nineteen short chapters bear various fanciful titles: Testa nera

(Italian, black head, for the 'negro-head' crystals of tourmaline from the isl of Elba, where the author in 1909 commenced his long study of pegmati Moncha (Moncha tundra in the Kola peninsula—'this pure epic poem'); I of a word (Afrikanda, for railway station no. 68 in the Kola peninsula on a day); Black and white; Marble, marble and marble; Revolt of the atoms. M prosaic chapter-headings are: Alabaster; Belomorite (trade-name for moons from the White Sea = Белое Море): Celestine; Diamond. L. J. S.

Fersman (A. E.). *Twenty-five years of Soviet natural science.* Moscow (For Languages Publishing House), 1944, 59 pp.

Fersman (Alexander). *The march of Soviet science.* London (Soviet War New 1945, 48 pp., 47 portraits.

Two translations from the Russian, giving an account of the intensive activ into the investigation of natural resources, including mineral deposits. P hypotheses are advocated. [**6**–193; **7**–112.] L. J. S.

[Fersman (A. E.)] Ферсман (А. Е.). Пегматиты. Том I, Гранитные пегматит Третье исправленное и дополненное издание. [*Pegmatites. Vol. I, Grani pegmatites.* Third revised and enlarged edition.] Moscow & Leningr (Acad. Sci. USSR), 1940, 712 pp., 11 pls., 85 text-figs., 155 tables. Pri 42 r. (Russian only.)

Earlier editions of this standard work on the petrogenesis, geochemistry, & of granite-pegmatites were published in 1931 (646 pp.) and in 1932 (665 p [M.A. **5**–1; **6**–338]. In the present volume close on half the references quoted the 26 pages of bibliography are of more recent date, Russian works predom nating by a small margin. The German table of contents given in the first editi is now omitted. C. F. D.

[Labuntzov (A. N.)] Лабунцов (А. Н.). Пегматиты СССР. II. Пегмати северной Карелии и их минералы. [*Pegmatites of the USSR. II. Pegmati of north Karelia and their minerals.*] Москва-Ленинград (Акад. Нау СССР.) [Moscow & Leningrad (Acad. Sci. USSR)], 1939, 260 pp., 1 (map), 113 text-figs. Price (bound) 13 r. 50 k. [M.A. **7**–298.]

This detailed monograph deals with the pegmatite intrusions, many of co posite character, found along the west coast of the White Sea and south-west the Kandalaksha gulf. In addition to the common minerals microcline (pink-a white), plagioclase, quartz, muscovite, and biotite, some fifty accessory speci are recorded, among them bismuth, bismuthinite, molybdenite, and oth metallic sulphides. Chemical analyses, in many cases accompanied by cryst measurements and drawings and by optical data, are given for microcline, olig clase, biotite, muscovite, garnet (almandine-pyrope), scapolite, zircon a cyrtolite, kyanite, zoisite, orthite, tourmaline, xenotime, monazite, apati pitchblende, gummite, and radioactive bitumen (carburan). The geochemist of the pegmatites is discussed at length: beryllium minerals are absent, wh lithium is confined to small amounts in the biotite and tourmaline. [M.A. **6**–4 520.] C. F. D.

VARITZKY (A. N.)] Заварицкий (А. Н.). Введение в петрохимию изверженных горных пород. [*Introduction into the petrochemistry of igneous rocks.*] Publ. Acad. Sci. USSR, 1944, 324 pp., 107 figs.

his extensive treatise represents the development of a graphical method of esentation of chemical composition of igneous rocks, first suggested by the hor in 1926 [M.A. **3**–228] and already applied by him to sundry petrochemical blems [M.A. **7**–32, 195]. The method consists in a recalculation of the chemical lysis into a number of coefficients, some of which are related to theoretical eral molecules, others to oxides. The four principal coefficients are plotted new type of diagram corresponding to an opened-up rectangular tetrahedron ncating a corner of a cube) and represented by two adjoining right-angled ngles. Each analysis corresponds to two points on this diagram. The remain- coefficients are plotted on the same diagram and are represented by two itional points. The points thus produced are connected in their appropriate ples by vectors, the position, length, and inclination of which give a graphical esentation of the chemical composition of a given rock. The correlation of coefficients with the actual mineral composition shows that the coefficients sufficiently accurate to express the mode as well as the chemical com- ition of rocks. The method is applied to the study of certain Tertiary and ternary igneous rocks of the Pacific, Atlantic, Mediterranean, Indian, and ican regions, and certain petrochemical generalizations are deduced. The torial diagrams are also applied to the study of silicate melts, and their physico- mical significance is discussed. The book contains a detailed account of the mistry and crystal-chemistry of rock-forming minerals, the chemical character gneous rocks, a review of various systems of graphical representations of rock lyses, the mathematical principles of graphic representation, and a new scheme the chemical classification of igneous rocks. [M.A. **9**–157.] S. I. T.

EL (Wilhelm). *Physikalische Chemie der Silikate.* 2nd edition, Leipzig (J. A. Barth), 1941, vii+826 pp., 653 figs. Lithoprinted by Edwards Brothers, Ann Arbor, Michigan, 1944, price $21.00.

n exhaustive treatise on the structure of silica and silicates in the crystalline, d and glassy, and colloidal states, and their thermo-chemical properties. uilibrium systems for melts, dry or with volatiles, and for technical materials sses, slags, ceramic materials, and hydraulic cements) are dealt with in detail. merous references are given to the literature, and there is a separate index of ne 2200 authors. Besides the general index, there are also indexes of minerals rocks and of systems. L. J. S.

DZINSKI (Paul). *Diamond tools.* London (N.A.G. Press) & New York (Anton Smit & Co.), 1944, xvi+iii[*bis*]+392 pp., 222 figs. Price 20*s.*

his is a much enlarged translation of the German edition of 1936 [M.A. **7**–186], h in the format and in the number of pages and illustrations, with additions he end of 1942. It has been printed in America, but in this [1945] issue by the .G. Press a fresh title-page and table of contents have been inserted and a ailed index added. While giving good descriptions of diamond tools, as porated in the same author's other book [M.A. **8**–266], the present volume

deals more with the use of these tools for hardness testing, truing grinding wh cutting metals and non-metals, machining of glass, natural and artificial st rock drilling, engraving, drawing of fine wires, and the use of diamond dust a abrasive. The book is full of useful information, even as to the correct wa using a glazier's diamond. L. J. S.

Shipley (Robert M.) assisted by others. *Dictionary of gems and gemology.* Angelos & Boston (Gemological Inst. Amer.), 1945, xi+254 pp. Price $

This handy book of reference contains more than 4000 dictionary entries gi clear and concise definitions of the names (many of them quite trivial) of g materials, and of scientific and trade terms used in their description and prepa tion, together with much miscellaneous information bearing on gemsto [M.A. **6**–5.] L. J. S.

Rock-forming Minerals and Petrology

Solodovnikova (L. L.) Солодовникова (Л. Л.). Полевые шпаты Хибинск тундр.—*The feldspars of the Khibine tundras.* Труды Ленинград. Об Ест., Отд. Геол. Мин. (Trav. Soc. Nat. Leningrad, Sect. Géol. Min.), 19 vol. 66, no. 1, pp. 34–87 (Russian), p. 88 (English summary), 4 pls., 4 te figs.

Optical data and chemical analyses are given of felspars from pegmati associated with the alkalic rocks of the Khibina massif, Kola peninsula. In t khibinite and foyaite pegmatites the felspar is microcline-perthite with about 1 and up to 40% perthitic albite respectively; while in the mica-nepheline-syen pegmatite it is cryptoperthite, consisting of nearly pure potash-felspar with perthitic albite, and with an optic axial angle near to anorthoclase. The felsp in the mother-rocks have much the same characters as those in the associat pegmatites. In the khibinite and foyaite zones albite is of importance and of fo generations: poikilitic, perthitic, 'chess-board' in part antiperthite, and fine granular. [M.A. **7**–179.] L. J. S.

[Zavaritzky (A. N.)] Заварицкий (А. Н.) Zavaritsky (A. N.). *A new diagr for the determination of plagioclase twins.* Compt. Rend. (Doklady) Aca Sci. URSS, 1942, vol. 36, pp. 14–16, 1 fig.

With the five-axis universal microscope-stage it is possible, after fixing t optical orientation of the crystal, by further rotations to determine the twin-la and the anorthite content of the plagioclase without further plotting. Curves a given. [M.A. **4**–209; **8**–15.] L. J. S.

Emmons (R. C.) & Gates (R. M.). *Plagioclase twinning.* Bull. Geol. Soc. Ame 1943, vol. 54, pp. 287–303, 4 pls.

Donnay (J. D. H.). *Plagioclase twinning.* Ibid., 1943, vol. 54, pp. 1645–1651.

In the first paper the authors conclude that polysynthetic twinning is develop late in the growth of a plagioclase crystal, twinning being a slow crystal respon to stress, commonly due to the forces exerted by the mutual interference growing crystals or by the flow of viscous fluid. Discontinuous twin-lamell characterize metamorphic and hybrid rocks. Frequent differences in compositi

veen adjacent lamellae is attributed to selective post-twinning replacement leuteric solutions: similar selective replacement may also take the form of itization, kaolinization, or chloritization. The second paper is a criticism, in h the author emphasizes that internal factors of twin-control in general veigh external ones. C. F. D.

NBACH (Erich). *Die irisierenden Labradorite von Turtschinka.* Zeits. prakt. Geol., 1943, vol. 51, pp. 57–58, 1 fig. (sketch-map).

x deposits of light grey, iridescent labradorite are found within a province of thosites and gabbro-norites close to Turtchinka, a small railway station way between Zhitomir and Korosten in Volhynia, Ukraine. The labradorite been worked as an ornamental stone, and blocks up to a cubic metre in volume e been obtained. C. F. D.

DEGÅRDH (P. H.). *Bytownit aus Anorthosit von Bönskär im nördlichen Teil der Stockholmer Schären und seine Beziehungen zu verschiedenen Feldspatsbestimmungskurven.* Bull. Geol. Inst. Univ. Upsala, 1941, vol. 28, pp. 415–430, 3 figs.

nalysis of the separated bytownite gave SiO_2 45·16, Al_2O_3 34·32, Fe_2O_3 0·20, O 0·009, CaO 17·34, Na_2O 1·40, K_2O 0·29, H_2O+ 0·71, H_2O- 0·32 = 99·75; gr. 2·725. A deficiency of SiO_2 1·25% for the formula $Ab_{12\cdot1}An_{87\cdot9}$ suggests the ence of the carnegieite molecule. Twinning on the pericline and albite laws; sionally on the Carlsbad, Esterel, and Manebach-Esterel laws. The optical ntation and data, α 1·5695, β 1·574, γ 1·581 (Na), $2V_\gamma$ 101·6°, are compared the curves of various authors; there are differences, especially in the orientaand twinning, between the felspars of plutonic and volcanic rocks. L. J. S.

DONALD (Gordon A.). *Potash-oligoclase in Hawaiian lavas.* Amer. Min., 1942, vol. 27, pp. 793–800.

nterstitial felspar in some of these lavas, with refractive indices of oligoclase ndesine but with small positive optic axial angle, was assumed by Barth A. **4**–398, 508] to contain the carnegieite (or nepheline) molecule and was cribed as anemousite. Fifteen chemical analyses of lavas containing 3–50 lal % of this felspar all show orthoclase in their norms; some show quartz and all show nepheline. This felspar is therefore now referred to potash-oligoclase n. Mag. **15**–428; **20**–331]. In some phenocrysts the abnormal optical properties y be explained by the overlapping of twinned portions [M.A. **8**–158].

L. J. S.

REMOV (G. M.) Ефремов (Г. М.). О природе калинатрового полевого шпата в палеозойских интрузиях северного Кавказа. *On the nature of potassium-sodium feldspar in the Palaeozoic intrusions of the north Caucasus.* Изв. Акад. Наук СССР, Сер. Геол. (Bull. Acad. Sci. URSS, Sér. Géol.), 1939, no. 3, pp. 116–125. (Russian with English summary.)

Contrary to the former opinion, the author found that the granites in the north casus contain anorthoclase and microcline and not orthoclase. The results of asurement on the Fedorov stage of 84 crystals of felspar are given.

S. I. T.

Belyankin (D. S.) Белянкин (Д. С.). К минералогии калинатровых полевых шпатов.—*On the mineralogy of K-Na feldspars.* Изв. Акад. Наук СССР, Сер. Геол. (Bull. Acad. Sci. URSS, Sér. Géol.), 1944, no. 5, pp. 65–[illegible] (Russian with English summary.)

The author expresses his scepticism of the alleged polymorphism in the se[illegible] of potash-soda felspars, which, according to him, are only represented by me[illegible] stable morphological modifications. S. I. D[illegible]

Dolar-Mantuani (L.) & Koritnig (S.). *Die Feldspäte von Schwanberg (Steiermark).* Zeits. Krist., 1939, vol. 101, pp. 30–38.

Measurements with the Fedorov stage are given with chemical analysis of potash-anorthoclase $Or_{70}Ab_{24}An_6$, occurring as large smoky-grey crystals in aplite veins in marble. F. A. B[illegible]

Michot (P.). *Perthites du stade magmatique dans une roche éruptive.* Ann. Soc. Géol. Belgique, 1944 [i.e. 1945], vol. 68 (for 1944–5), Bull., pp. в 40–43, 1

Perthite in pegmatite from Egersund, Norway, has resulted by exsolution plagioclase in the orthoclase host with falling temperature during the magmatic stage. This took place previous to the formation of myrmekite, also formed dur[illegible] the magmatic stage. Plagioclase lamellae extend from the perthite into t[illegible] myrmekite border between the felspar and quartz, this border being corroded quartz. L. J. S[illegible]

Buntin (G. N.) Бунтин (Г. Н.). Генезис антипертитов в Карельских пегматитовых жилах.—*The genesis of the antiperthites in the Karelian pegmatite-veins.* Труды Ленинград. Общ. Ест., Отд. Геол. Мин. (Trans. Soc. Nat. Leningrad, Sect. Géol. Min.), 1937, vol. 66, no. 1, pp. 109–1[illegible] (Russian), p. 128 (English summary), 12 figs.

Antiperthite is present in veins that contain much microcline and is general absent when there is none. In the common type, films of microcline penetra plagioclase along cleavages and twin junctions, suggesting a later introducti of microcline replacing plagioclase, with the production of associated mu covite and calcite. A less common type, with scattered particles of microcli in plagioclase, resembles cryptoperthite or fibrous perthite; this suggests t exsolution of potash-felspar from plagioclase. L. J. S.

Maucher (Albert). *Über geregelte Plagioklaseinschlüsse in Orthoklas (Sanidin).* Zeits. Krist., 1943, vol. 105, pp. 82–90, 6 figs.

Phenocrysts (3 cm.) of sanidine in syenite-porphyry from Keban mins Turkey, contain scattered enclosures of small crystals of plagioclase (An 26–30° which usually show albite-Carlsbad twinning. The (010) plane of plagioclase parallel to one or other faces of the sanidine as marked out by zonal growth With the coincidence of the (010) planes of both, the *c*-axes are also parallel. L. J. S.

Naidu (P. R. J.). *Inclined extinction in the hypersthenes of charnockites.* Curre[illegible] Sci. Bangalore, 1943, vol. 12, pp. 157–158, 1 fig.

This hypersthene has 2V 54° 42′, optic axial plane (010), $\alpha \perp$ (100); pleochrois

ık, β brownish-yellow, γ bluish-green. Measured extinction-angles of 11–13° 26° are calculated to be on the pyramid planes (111) and (232) respectively.
L. J. S.

SON (W. N.). *The basic igneous rocks of eastern Otago and their tectonic environment. Part IV.—The mid-Tertiary basalts, tholeiites and dolerites of north-eastern Otago. Section B:—Petrology, with special reference to the crystallisation of pyroxene.* Trans. Roy. Soc. New Zealand, 1944, vol. 74, pp. 71–123, 9 figs.

escriptions with optical data and graphs are given of the constituent minerals, icularly the monoclinic pyroxenes. The term pigeonite is limited to material 2V 0–30°, and is subdivided into magnesian pigeonite, pigeonite, and pigeonite, according to the ratio Mg : Fe. Pigeonite of other authors with 30–45° is called subcalcic augite. L. J. S.

S (H. H.). *Augite in Hawaiian basalt.* Amer. Journ. Sci., 1944, vol. 242, p. 625.

DONALD (Gordon A.). *Pyroxenes in Hawaiian lavas.* Ibid., pp. 626–629.

discussion on the terms to be applied to pyroxenes according to their value V. A pyroxene with 2V 45°, referred by Macdonald [M.A. **9** 162] to pigeonite, ld according to the classification of Hess [M.A. **8**–233] be called augite. donald doubts the existence of a gap in the series between 2V 32° and 2V 39°. his 'pigeonite' he now suggests the name pigeonitic augite. L. J. S.

DU (P. R. J.). *Pigeonite in the "abnormal" dolerite dykes of charnockitic areas in Mysore.* Current Sci. Bangalore, 1943, vol. 12, pp. 114–115, 1 fig.

rplish pigeonite, forming 60% of the rock with oligoclase-andesine 40%, kelyphitic borders of soda-amphibole. It has 2V 13–18°, positive, $\beta = b$, $= +27°$, $\gamma - \alpha$ 0·020; pleochroism, α pink, β brownish-pink, γ pale green.
L. J. S.

LKER (Frederick). *Note on the pyroxenes of basaltic magma.* Amer. Journ. Sci., 1943, vol. 241, pp. 517–520.

riticism of Hess [M.A. **8**–233]. In the triangular diagram Wo–En–Fs a larger should be given for pigeonite, in which with $2V < 32°$, the optic axial plane be either parallel or perpendicular to (010). The name magaugite is suggested ace of endiopside. The order of crystallization of pyroxenes may be influenced volatile constituents. The exsolution of augite from orthopyroxenes is also ussed. L. J. S.

MAN (Henri M.). *Analyse chimique d'une augite du cap Tourmente.* Nat. Canadien, 1942, vol. 69, pp. 161–163.

ark green prismatic crystals of augite from cape Tourmente, St. Joachim, ltmorency Co., Quebec, gave SiO_2 41·75, TiO_2 0·5, Al_2O_3 10·55, Fe_2O_3 13·05, 0·72, MgO 13·71, CaO 19·25, alkalis n. d., total 99·53, sp. gr. 3·48. The erial shows abnormal pleochroism (on cleavage flakes dark bluish-green and owish-green) and marked dispersion ($r > v$); $\gamma : c = 53°$. L. J. S.

Hutton (C. O.). *The igneous rocks of the Brocken range—Ngahape area, east Wellington.* Trans. Roy. Soc. New Zealand, 1943, vol. 72, pp. 353–370, 1 3 text-figs.

Petrographical descriptions and chemical analyses are given of teschenit dolerite, and variolite. Diopsidic augite separated from teschenite from Red H has sp. gr. 3·34, α 1·690, β 1·697, γ 1·715, 2V 52–54°, $\gamma : c = 42°$; analysis F. T. Seelye gave SiO_2 49·57, TiO_2 2·05, Al_2O_3 3·82, Fe_2O_3 2·00, FeO 6·59, N 0·04, MnO 0·13, MgO 13·75, CaO 21·44, Na_2O 0·69, K_2O 0·08, SrO 0·006, P_2O_5 V_2O_5 0·045, H_2O+ 0·10, H_2O- 0·02 = 100·33. Thomsonite (α 1·513, β 1·5 γ 1·522, 2V 68°) and analcime (n 1·482) are present in the teschenites. L. J. S.

Tôrre de Assunção (Carlos F.). *Contribuïção para o estudo das piroxenas d rochas basálticas portuguesas.* Bol. Mus. Lab. Min. Geol. Univ. Lisboa, 1 vol. 3 (for 1938–42), pp. 105–217, 2 pls., 12 text-figs.

The crystallization of pyroxenes is considered, with reference to the concent tion of iron in the final stages. Many optical data (extinction-angles, birefringen and optic axial angles) are recorded, and their relation to the chemical compo tion of the pyroxenes and rocks is discussed. L. J. S.

Kashkai (Mir-Ali). *The augites from Talysh (Azerbaidjan).* Compt. Ren (Doklady) Acad. Sci. URSS, 1944, vol. 43, pp. 351–353.

Porphyritic crystals of augite from friable 'black augite tuff' underlyi Eocene basalt are of short-prismatic habit from Pirazora village (anal. I) long-prismatic, up to 1 cm., from Dighya village (anal. II). They are also fou in the magnetite-augite sands on the shore of the Caspian sea. Crystal-forn *a m b s z o p* [Dana's letters]. Formula $(Ca,Mg,Fe'')O.2SiO_2.0·2(Al,Fe''')_2O_3$.

	SiO_2.	TiO_2.	Al_2O_3.	Fe_2O_3.	FeO.	MgO.	CaO.	R_2O.	H_2O+.	Total.	Sp. gr.	α.	γ
I.	47·01	0·86	3·22	7·83	5·03	13·10	22·14	0·24	0·74	100·17	3·4625	1·692	1·7
II.	47·42	0·68	4·34	6·04	4·57	14·50	21·44	0·17	0·91	100·07	3·5347	1·692	1·7

L. J. S.

[Sarkisyan (S. G.)] Sarkissian (S. G.). *Aegirite in the Quaternary deposits of t Moscow region.* Compt. Rend. (Doklady) Acad. Sci. URSS, 1944, vol. 43, p. 2

Small grains of aegirine (α 1·745, β 1·776, γ 1·784, extinction-angle 2°) and single grain of ramsayite found in deposits in the Solnechnogorsk district we perhaps derived from the Kola peninsula. L. J. S.

Jayaraman (N.). *Tremolite and actinolite from the dolomite marble of Yellan Singareni.* Journ. Indian. Inst. Sci., 1940, vol. 23A, pp. 44–46.

Tremolite from this locality in Hyderabad [M.A. **8**–161, **9**–169] as greyis white bladed crystals forms 2½–10% of the rock, α 1·6112, β 1·6245, γ 1·63 (Na); analysis I agrees with $(OH)_{1·7}Ca_2(Mg,Fe)_{5·2}(Si,Al)_8O_{22}$. Green actinoli occurs only sparingly; anal. II, $(OH)_{1·9}Ca_2(Mg,Fe)_{5·2}(Si,Al)_8O_{22}$.

	SiO_2.	Al_2O_3.	Fe_2O_3.	FeO.	MgO.	CaO.	H_2O.	Total.	Sp. gr.	γ : c
I.	57·98	0·16	0·11	1·12	24·39	13·92	1·85	99·53	2·9962	18
II.	55·89	1·15	0·36	5·83	21·20	13·27	1·99	99·69	3·0415	18

L. J. S.

KITIN (W.) [NIKITIN (V. V.) 1867–1942] & KLEMEN (R.). *Crossit aus Vodno bei Skoplje.* Neues Jahrb. Min., Abt. A, 1938, Beil.-Bd. 74, pp. 36–49, 1 fig.
CHATSCHKI (F.). *Die Formel des Crossits von Vodno.* Neues Jahrb. Min. Monatshefte, Abt. A, 1943, pp. 129–131.

A calc-schist (77–87% calcite) from Serbia contains black needles (2–3 mm. long) in alkali-amphibole with chlorite, epidote, and albite. The needles show zonal ucture with 2V 12–65°, usually about 40°, negative, β about 1·645, $\gamma-\alpha$ 0·011, = *b*, $\beta : c = -8°(?)$; strong pleochroism, α pale yellow, β Prussian blue, iolet. Analysis gave SiO_2 56·03, TiO_2 0·36, Al_2O_3 8·67, Fe_2O_3 7·11, FeO 9·46, O 0·11, MgO 8·81, CaO 1·28, Na_2O 6·98, K_2O 0·13, H_2O+ 1·22, H_2O- 0·29, O_5 0·04 = 100·49, sp. gr. 3·115. These results are compared with analyses and tical data of glaucophane, riebeckite, crocidolite, crossite, and ternovskite. iculated to the glaucophane and riebeckite molecules of W. Kunitz [M.A. **4**–200] the analyses show a large excess of iron; and by preference they are calculated the jadeite and aegirine molecules together with $FeSiO_3$, $(Mg,Ca)SiO_3$, Na_2SiO_3, d H_2SiO_3, but even then there are various residues unaccounted for.
The formula $(OH,O)_2(Na,K,Ca)_2(Al,Fe''',Fe'',Mg,Mn,Ti)_5(Si,Al)_8O_{22}$ is given the second note, but the analysis of the Vodno mineral shows a deficiency of ter and an excess of alkali, suggesting a partial replacement of water by :alis. L. J. S.

LES (Keith R.). *Grunerite in Western Australia.* Amer. Min., 1943, vol. 28, pp. 25–38, 4 figs.

Grunerite is abundant at several places in Western Australia in metamorphosed nded ironstones (jaspilites). Material in banded magnetite-grunerite-quartzite m Meier's Find, Mt. Palmer, is weakly coloured and feebly pleochroic; α 1·673, about 1·694, γ 1·711, $\beta = b$, $\gamma : c = 13\frac{1}{2}–14°$, 2V about 85°, negative. Analysis C. R. LeMesurier, SiO_2 50·37, P_2O_5 0·02, Al_2O_3 0·54, Fe_2O_3 0·56, FeO 40·08, nO 1·07, MgO 4·47, CaO 0·83, H_2O+ 2·24, H_2O- 0·20 = 100·38, sp. gr. 3·45, rresponds to $(OH)_{2·36}$(Fe, &c.)$_{6·75}$$(Si,Al)_8O_{22}$, ($FeSiO_3$ 79·9%). Material from t. Windarra has α 1·663, β 1·680, γ 1·696, $\gamma : c = 15–15\frac{1}{2}°$, 2V about 85°, and ntains FeO 29·51, MgO 9·7%, ($FeSiO_3$ 58·2%) very close to cummingtonite. blue-green amphibole, sometimes in parallel growth on the grunerite is very rongly pleochroic, α light green to yellowish-green, β dark olive-green, γ intense ue-green; α 1·673, γ 1·701, $\gamma : c = 21–22°$, 2V about 80°, negative; Fe_2O_3 8·7, eO 25·0%. L. J. S.

IUDOBA (K. F.) & FRECHEN (J.). *Der Einfluß der Temperatur auf die Beziehung zwischen Optik und Chemismus der Olivine.* Neues Jahrb. Min. Monatshefte, Abt. A, 1943, pp. 91–106, 2 figs.

Numerous determinations are given of the optic axial angle and specific gravity olivines from basalt, dunite, &c. In plutonic rocks 2V shows only a slight riation and the mean value corresponds with the chemical composition; in lcanic rocks there is a wider variation and less agreement with the chemical mposition. Olivine from a plutonic rock when ignited shows a small decrease the optic axial angle. [Min. Mag. **25**–229; **26**–11.] L. J. S.

Bartrum (J. A.). *Unusual olivine in basalt near Auckland, New Zealand.* Jour Geol. Chicago, 1942, vol. 50, pp. 914–917, 1 fig.

Olivine phenocrysts (2V 90°) are clouded with a ubiquitous separation of iro ore, attributed to reaction between an early ferriferous olivine and liquid.

C. F. D.

Turner (Francis J.). *Preferred orientation of olivine crystals in peridotites, wi special reference to New Zealand examples.* Trans. Roy. Soc. New Zeala 1942, vol. 72, pp. 280–300, 8 pls., 4 text-figs.

This paper presents and discusses fabric data for numerous New Zealand dun and olivine-nodules from basalts, as well as for comparable European rock principally the peridotites of Rum and Skye. No preferred space-lattice orientat of olivine was found in flow-banded mugearitic lavas, or in the undeform gravitationally-differentiated peridotite of the Lugar sill, Ayrshire. C. F. D.

Prider (Rex T.) & Cole (W. F.). *The alteration products of olivine and leuci in the leucite-lamproites from the west Kimberley area, Western Austral* Amer. Min., 1942, vol. 27, pp. 373–384, 1 fig.

X-ray, optical, and staining tests and a chemical analysis of the turbid alteratio product of the leucite indicate a mixture of orthoclase and an unidentified cla mineral without any leucite. The alteration product of the olivine consists mainl of a mineral of the montmorillonite group, confirming the previous determinatio as nontronite [Min. Mag. **25**–386; M.A. **8**–28]. X-ray powder data are also give of leucite from Albano, Italy, and of diopside from the Kimberley district.

L. J. S.

Postel (A. Williams) & Adelhelm (William). *White mica in the Wissahicko complex.* Amer. Min., 1944, vol. 29, pp. 279–290, 2 figs.

White mica from granitic rock and schist from Wissahickon valley, Phila delphia, Pennsylvania, has fairly constant refractive indices but variable value of 2V (22–50°). A specimen selected for chemical analysis (F. A. Gonyer) yield α 1·573, β 1·604, γ 1·611; measured values of 2V 26–47°, and the calculated valu 48° 44′; SiO_2 46·10, TiO_2 2·04, Al_2O_3 30·54, Fe_2O_3 3·43, FeO 1·96, MgO 1·71 CaO 0·07, Na_2O 3·82, K_2O 6·54, H_2O+ 3·83, F 0·05, total 100·09. A Laue photo graph of cleavage flakes normal to the cleavage reveals asterism, which indicate random shifts of successive layers in the crystal-structure, a condition not ob served for true muscovite. Random shifts in the lattice would account, however for the variable values of 2V.

F. A. B.

Pichamuthu (C. S.). *A note on the occurrence of chloritoid in the Tumkur district Mysore state.* Current Sci. Bangalore, 1943, vol. 12, p. 332, 1 fig.

Glistening black disks of chloritoid occur with chlorite, sericite, and quartz in a schist at Lakkasandra. They cut across the schistosity and enclose much quartz and ilmenite. Pleochroism strong, α green, β indigo-blue, γ pale yellowish-green, $\gamma-\alpha$ 0·009–0·01, positive, $\gamma : \perp(001) = 9°$.

L. J. S.

RNER (F. J.). *Zircon in sedimentary rocks of Otago.* New Zealand Journ. Sci. Techn., Sect. B, 1944, vol. 25 (for 1943), pp. 89–90.

Estimates of the amount of zircon in sediments of Cretaceous to Pleistocene age the gold-mining districts gave not more than 2 ounces per cubic yard. The y sands' obtained by sluicing for gold contain 50 70% zircon, but the amount t can be saved is of no economic importance. The zircon has been derived from underlying schists. L. J. S.

ALINSON (W. Harold). *Idiomorphic cordierite from Safe Harbor, Pennsylvania.* Amer. Min., 1942, vol. 27, pp. 646–648, 2 figs.

Minute crystals (0·002–0·004 mm. across the prism face) of cordierite occur in a ociated zone of mica-schist invaded by diabase with the production of ortho-e, cordierite, and a second generation of biotite, hercynite, rutile, and silli-nite. Single and twinned crystals have α 1·545, γ 1·552, 2V 60–65°, negative, the material is mostly altered to pinite or chlorophyllite. In being idiomorphic aureolitic cordierite differs from the granular cordierite of granitic gneisses. er hydrothermal action in the schist produced albite, quartz, chlorite, sphene, L. J. S.

OVSESYAN (S. A.)] Мовсесян (С. А.). Парагачайское месторождение андалузита.—Movsesian (S. A.). *The Paraga-Tchai deposit of andalusite.* Изв. Акад. Наук СССР, Сер. Геол. (Bull. Acad. Sci. URSS, Sér. Géol.), 1939, no. 6, pp. 159–171, 2 figs. (Russian with English summary.)

ndalusite-rich rock is found among hornfels (secondary quartzite) along the tact with the granitoid rocks in the central part of the Kungur–Alanghes range Armenia. The following minerals occurring in the hornfels are described: alusite, muscovite (analysis given), corundum, diaspore, rutile, zircon, manite, felspar, and lazulite. [M.A. **8**–379.] S. I. T.

DERMAN (A. R.). *Sillimanite, kyanite, and clay deposits near Williamstown, South Australia.* Trans. Roy. Soc. South Australia, 1942, vol. 66, pp. 3–14, 8 figs.

Massive quartz-sillimanite and quartz-kyanite rocks associated with kyanite-ists, quartz-kyanite-gneisses, and kyanite-bearing pegmatites are found in a on of low-grade (biotite zone) metamorphosed sediments, also intruded by mal pegmatites. The derivation of the aluminosilicate-bearing assemblages scribed to metasomatism of the country-rock by aluminium-rich solutions of gmatic origin. Later pegmatitic and hydrothermal phases led to the partial version of sillimanite to clay (probably dickite) and of kyanite to damourite. e fire-clay and rocks are exploited as refractories. Fine-grained massive green nourite (anal. Alderman) and coarse foliated damourite (anal. A. T. Dalwood) e respectively on analysis: SiO_2 44·61 (44·95), Al_2O_3 38·62 (39·48), TiO_2 0·02 (–), O_3 0·98 (trace), FeO 0·24 (–), MgO 0·11 (0·32), CaO 0·71 (nil), Na_2O 0·69 (0·98),) 9·54 (9·22), H_2O+ 4·47 (4·92), H_2O- 0·13 (0·47), total 100·12 (100·34). C. F. D.

Hutton (C. O.). *Piedmontite-bearing quartz schists from Black Peak, north-west Otago.* New Zealand Journ. Sci. Techn., Sect. B, 1942, vol. 23, pp. 231–

A quartz-piedmontite-muscovite-schist contains piedmontite with α 1·7 β 1·773, γ 1·795, 2V 82°±3°, positive; and colourless tourmaline (elbaite) ω α 1·618, γ 1·641. The preferred orientation of the piedmontite is discussed. T locality is possibly the source of the piedmontite-bearing boulders in the Shot river [Min. Mag. **23**–416; M.A. **8**–19]. C. F. D.

Rao (M. R. Srinivasa). *Chlorophæite bearing basalts from the Cuddupah t (pre-Cambrian).* Current Sci. Bangalore, 1942, vol. 11, p. 396, 1 fig.

Chlorophaeite as irregular patches and spherules occurs in basalt of the Cuddu system in south India. It has been previously recorded in Indian basalts Jurassic and Tertiary age, but not of pre-Cambrian. L. J. S.

Raw (Frank). *Some altered palagonite tuffs from Jamaica and the origin history of their chlorites.* With a section on the geologic relationships by C. Matley. Journ. Geol. Chicago, 1943, vol. 51, pp. 215–243, 13 figs.

A discussion of a specimen of palagonite-tuff rich in analcime and derived albi Chlorite was developed, first from basic volcanic glass on palagonitization, a second, during later deformation of the rock. C. F. D.

Starrabba (A. Stella). *Sopra alcuni minerali pneumatolitici di Acicatena (Etn* Periodico Min. Roma, 1942, vol. 13, pp. 157–174, 3 figs.

Crystallographic and optical data are given for the following minerals of sol taric origin occurring as small crystals on large crystals of haematite on blocks reddened scoria: apatite, hypersthene (szaboite), augite, hornblende (xiphonit oligoclase-albite, and pseudobrookite. The last gave $a : b : c = 1{\cdot}0014 : 1 : 1{\cdot}135$ α 2·42, γ 2·47; analysis TiO_2 46·5, Fe_2O_3 51·5, MgO 2·0, agreeing with $2Fe_2O_3.3TiO$ L. J. S.

Bellanca (Angelo). *Identificazione e dosaggio delle modificazioni polimorfe minerali delle rocce mediante l'analisi termica. (Nota I). Natura e dosag della silice non combinata nelle ftaniti.* Periodico Min. Roma, 1943, vol. pp. 277–286, 4 figs.

Determination of quartz, tridymite, and cristobalite in fine-grained phthani rocks by thermal analysis. L. J. S.

Faust (George T.). *The differentiation of magnesite from dolomite in concentr and tailings.* Econ. Geol., 1944, vol. 39, pp. 142–151, 2 figs.

On heating to about 550° C. for one hour magnesite changes to periclase wh is easily distinguished from the unaltered dolomite by microscopical and stainin methods. M. A. P.

Wolff (Tielmann *Freiherr von*). *Methodisches zur quantitativen Gesteins- u Mineral-Untersuchung mit Hilfe der Phasenanalyse. (Am Beispiel d mafischen Komponenten des Eklogits von Silberbach.)* Min. Petr. Mi (Tschermak), 1942, vol. 54, pp. 1–122, 1 pl., 20 text-figs.

The constituent garnet, omphacite, and hornblende (smaragdite) of the zoisit

ɔgite of Silberbach, Bavarian Fichtelgebirge, each exhibit an appreciable range specific gravity and optical 'constants' within two cubic metres of rock, while zoisite shows a smaller but significant variation of the same kind. Several ned methods of determining these data were employed and are discussed at gth. Chemical analyses of each mineral are given for various fractions of a deter- ıed specific gravity range, and refractive indices or birefringences (sometimes ±0·00005!) are listed for various wave-lengths. The numerical results alone of investigation aggregate several pages. [Min. Mag. **24**–422.] C. F. D.

TURIN (V. P.) Батурин (В. П.). *On stability and formation of minerals of abyssal geospheres in the stratisphère.* Compt. Rend. (Doklady) Acad. Sci. URSS, 1942, vol. 37, pp. 32–34.

Only those species of minerals of abyssal geospheres are apt to synthesize in a imentary envelope, which show the highest stability under weathering con- ions.' In other words, only the more stable minerals of crystalline rocks are be found as authigenic growths in sedimentary rocks. These are quartz, rutile, con, tourmaline, and alkali-felspars. This postulate is discussed in connexion h the energetics of crystal lattices [M.A. **6**–469; **7**–6], clarkes of the chemical ments [M.A. **6**–286, 337; **7**–6], and *p*H of solutions. The tetravalent elements Ti, and Zr of the minerals mentioned have high *EK* values. L. J. S.

AND (S. J.). *The species concept in petrology.* Amer. Journ. Sci., 1944, vol. 242, pp. 45–52.

Linnaeus in 1770 gave generic and specific names to minerals and rocks on the ne lines as for animals and plants; and in the nineteenth century a pseudo- logical attitude towards petrogenesis gave rise to the theory of spontaneous gmatic differentiation. 'A science which is concerned with phase reactions and fting equilibria in a chemical system can no longer permit itself to be hampered traditional names, ill-defined species, and obsolete genetic theories.' L. J. S.

DDINGTON (A. F.). *Some petrological concepts and the interior of the earth.* (Presidential address.) Amer. Min., 1943, vol. 28, pp. 119–140, 5 figs.

A review is given of the various views on the constitution of zones beneath the th's crust as deduced from earthquake waves and from petrological considera- ns. A comparison is made with large igneous sills and with meteorites. A townite-anorthosite layer at a depth of 25–30 km. and probably a thin vitreous idotite shell at about 60–80 km. are postulated. L. J. S.

AVARITZKY (A. N.)] Заварицкий (А. Н.). Пересчет химических анализов изверженных горных пород и определение химических типов их. [*The recalculation of chemical analyses of igneous rocks and the determination of their chemical types.*] Издательство Акад. Наук СССР. [Publication of the Acad. Sci. USSR.] Moscow–Leningrad, 1941, 155 pp., 11 figs., 2 diagrams.

A new method of recalculation and plotting of chemical analyses of igneous ks is outlined and a number of tables and diagrams is given. The new method fers from the previous ones by the choice of coefficients and the method of tting by means of vectors instead of points. [M.A. **9**–147.] S. I. T.

Razumovsky (N. K.) Разумовский (Н. К.). *On the rôle of the logarithmico-normal law of frequency distribution in petrology and geochemistry.* Comp. Rend. (Doklady) Acad. Sci. URSS, 1941, vol. 33, pp. 48–49, 1 fig.

The arithmetical mean of $(K,Na)_2O$ 4–34% in 151 chemical analyses of volcanic rocks is 14·4%. A plot of percentages against frequencies gives an unsymmetrical curve with the most frequent value or mode at 11%. A more symmetrical curve is obtained by plotting percentages on a geometrical scale (2, 4, 8, 16 . . . at equal distances); this gives the geometrical mean and also the mode at 13·5%. In plotting in this manner it is suggested that better averages are obtained for rock constituents and for the amount of chemical elements present in the earth's crust ('clarkes'). [Min. Mag. **19**–303; **20**–1.] L. J. S.

DeLury (J. S.). *Generation of magma by frictional heat.* Amer. Journ. Sci., 1944, vol. 242, pp. 113–129, 1 fig.

In a solid crust 700 km. thick (rather than with a subcrustal weak shell postulated for isostasy) compressional creep brought about by thermal contraction is supposed to develop sufficient heat to produce sheets of molten material of variable composition (without appealing to differentiation). L. J. S.

Sobolev (V.) Соболев (В.). Кристаллохимия двойных солей и их роль в петрологии и минералогии.—*The crystallochemistry of double salts and their part in petrology and mineralogy.* Изв. Акад. Наук СССР, Сер. Геол. (Bull. Acad. Sci. URSS, Sér. Géol.), 1944, no. 5, pp. 69–77. (Russian with English summary.)

In the opinion of the author certain minerals, such as felspars, should be regarded as double salts and not compounds containing complex ions. This conclusion is applied to the crystallochemistry and paragenesis of minerals S. I. T.

Nikolaev (V. A.) Николаев (В. А.). О процессе отделения летучих соединений магмы.—*On the process of separation of the volatile compounds of magma.* Изв. Акад. Наук СССР, Сер. Геол. (Bull. Acad. Sci. URSS, Sér. Géol.), 1944, no. 5, pp. 51–64, 2 figs. (Russian with English summary.)

In accordance with Goranson's experimental work proving the comparatively low solubility of water in granitic magma, the author has constructed a new temperature-pressure-composition equilibrium diagram for the system water–silicate. The mechanism of separation of the gaseous and supercritical phases is discussed, and it is suggested that this diagram may have an application to pegmatites and magmatic emanations. [M.A. **7**–34.] S. I. T.

Billings (Marland P.). *Ring-dikes and their origin.* Trans. New York Acad. Sci. 1943, ser. 2, vol. 5, pp. 131–144.

Structural data relating to 115 ring dikes in 30 complexes recorded from the British Isles, U.S.A., and Norway are listed, with a bibliography. C. F. D.

Haff (John C.). *Petrology of two clastic dikes from the Placerville district, Colorado.* Amer. Journ. Sci., 1944, vol. 242, pp. 204–217, 1 pl., 1 text-fig.

The material of these narrow (8–24 inches) dikes traversing Permian to Cretaceous strata consists of abundant well-rounded fragments of igneous

amorphic, and sedimentary rocks from a deep-seated source, with angular ments of quartz, felspars, &c., in a matrix of carbonate and chalcedony. gmentation and deformation were essentially contemporaneous with em- ement and accomplished by forcible intrusion.' L. J. S.

HTFOOT (B.). *The Great Dyke of Southern Rhodesia.* (Anniversary address by the President.) Proc. Geol. Soc. South Africa, 1941, vol. 43 (for 1940), pp. xxvii–xlv, 11 pls., 1 table.

his is a summary of existing knowledge on this subject and includes a number laps and sections of critical areas and 28 chemical analyses. E. D. M.

BAARD (B. V.). *Dykes in the Transvaal.* (Anniversary address by the Presi- dent). Proc. Geol. Soc. South Africa, 1940, vol. 42 (for 1939), pp. xxvii–xliii.

rief descriptions with chemical analyses are given of four groups, viz. basic s in the Bushveld gabbro, basic dikes in the Old Granite of Pietersburg, dikes he eastern Transvaal, and post-Karroo dikes. More attention is devoted to s of the Pilansberg and East Rand systems which include syenite, foyaite, ase, and granodiorite. The relationships between these latter are discussed a differentiation origin for the foyaite is supported. E. D. M.

TENHOUSE (Gordon). *Curves for determining probable errors in heavy mineral studies.* Report of the Committee on Sedimentation, 1939–40, Div. Geol. Geogr., Nat. Res. Council, Washington, D.C., 1940, pp. 97–101. (Mimeo- graphed.)

he probable error in determination of the frequency of any one mineral in a y mineral assemblage is presented by curves on logarithmic graph paper, for uencies between 0·1 and 80%, and for counts of from 200 to 3000 grains. C. F. D.

HISRUD (Gordon C.). *Magnetic separations in petrography.* Amer. Min., 1942, vol. 27, pp. 629–637, 4 figs.

brief review of principles and difficulties. For clean magnetic separations the erial must be evenly sized. In an isomorphous Mg–Fe series, the Fe com- nd is the most strongly attracted, but in zoned crystals a clean separation of Fe mineral is not to be expected. C. F. D.

EMAN (Gerald O.). *Spectrographic data concerning the presence of the less common elements in rocks.* Amer. Min., 1942, vol. 27, pp. 776–779.

1 425 rock samples of various types the presence or absence of 31 chemical ients is recorded. L. J. S

DELL (Ernest B.) & GOLDICH (Samuel S.). *The rarer metallic constituents of some American igneous rocks.* Journ. Geol. Chicago, 1943, vol. 51, pp. 99–115, 167–189, 13 figs.

y means of chemical 'trace' methods 354 determinations were made of ain rarer metals in a large number of igneous rocks from Michigan, Minnesota,

Missouri, California, Texas, Massachusetts, and New Hampshire. The auth geochemical conclusions are largely in accordance with those of V. M. Goldsch [M.A. 7–165, 166]. New estimates of the average proportion of these mi elements in igneous rocks yield the results: Mo 0·00025, Be<0·0007, Pb 0·0 Zn 0·008, Cd 0·000015, Cu 0·007, Ni 0·008, Co 0·0023%. A hornblende fr granite at Stark, New Hampshire, gives on analysis by S. S. Goldich: SiO_2 45· Al_2O_3 2·52, TiO_2 2·88, Fe_2O_3 7·47, FeO 27·17, MnO 1·02, MgO 0·76, CaO 8· Na_2O 4·19, K_2O 1·09, H_2O+ 1·24, F 0·73, H_2O- 0·00 = 100·26 (−O = F, 99 α 1·692, β 1·698, γ 1·710, $\gamma : c = 16°$. Full analyses are given, but no optical c stants, for olivine from Talkai, Arizona, and from Kragerö, Norway.

C. F. D

Shimer (John Asa). *Spectrographic analysis of New England granites and peg tites.* Bull. Geol. Soc. Amer., 1943, vol. 54, pp. 1049–1066, 4 figs.

From spectrographic analysis of granites, associated pegmatites, and th component minerals, it is concluded that each granite has a distinctive conte of minor elements, and that the granites and granite minerals possess a grea proportion and variety of minor elements than the adjacent pegmatites a pegmatite minerals. The contents of barium and strontium, and of vanadi and chromium, vary sympathetically. Most elements are preferentially conce trated in the biotites of a two-mica granite, only barium, scandium, sodium, a strontium being concentrated in the muscovite; biotite, where present, contai the bulk of the minor elements of the rock. [M.A. 8–324.] C. F. D.

Bray (Joseph M.). *Distribution of minor chemical elements in Tertiary dike roc of the Front Range, Colorado.* Amer. Min., 1942, vol. 27, pp. 425–440, 1 f

Qualitative and quantitative determination of minor chemical constituents a series of hypabyssal monzonites and latites indicates a regional variation Pb, Ni, Co, Sc, Cr, V, and La. Quantitative estimations of minor elements (E Sr, Sc, La, V, Mn, Co, Ni, Zn) in plagioclase, biotite, and hornblende are include [M.A. 8–324.] C. F. D.

Rodolico (Francesco). *Ricerche sui constituenti minori di alcune rocce vulcanic dell' Italia centrale.* Periodico Min. Roma, 1943, vol. 14, pp. 99–132.

Spectroscopic determinations of Ba, Sr, Ti, V, Be, Mn, Zr, Cu, Pb, Ni, Co, and P in twenty felspathic and felspathoidal rocks, of which chemical analys of the main constituents are given. L. J. S.

Lundegårdh (P. H.). *Distribution of vanadium, chromium, cobalt and nickel eruptive rocks.* Nature, London, 1945, vol. 155, p. 753.

The amounts of trace elements in rocks of the normal differentiation sui (pyroxenite-hornblendite, basic quartz-gabbro, diorite, granite) of easte Upland, Sweden, are very similar to those of the Skaergaard intrusion in Gree land [Min. Mag. 26–283], while those of the late abnormal differentiation sui (peridotite, allivalite, ultrabasic norite, amphibole-gabbro, microcline-granit are different. L. J. S.

ANOV (A. A.) & LIZUNOV (N. V.) Иванов (А. А.) и Лизунов (Н. В.). Платиноиды в ультраосновных породах Урала.—*Platinoids in the ultrabasic rocks of the Urals.* Изв. Акад. Наук СССР, Сер. Геол. (Bull. Acad. Sci. URSS, Sér. Géol.), 1944, no. 5, pp. 78–86. (Russian with English summary.)

Spectrographic study of metals present in ultrabasic rocks in the Urals shows at in dunites the dominant metal is platinum, in pyroxenites—platinum and lladium, and in peridotites—osmium, iridium, and ruthenium. S. I. T.

WARDS (A. B.). *Differentiation of the dolerites of Tasmania.* Journ. Geol. Chicago, 1942, vol. 50, pp. 451–480, 579–610, 17 figs.

The dolerites of Tasmania occur as sills, sometimes over 1000 feet thick, and as ke-like bodies a mile or more across. Outcropping over some 6000 square miles, ey intrude Permo-Carboniferous and Trias-Jurassic strata. Petrographically ey are akin to the dolerites (tholeiitic basalt magma type) of the Karroo and ntarctica. The petrology of the rocks is described, with many chemical analyses. ree distinct series of pyroxenes—augites, orthopyroxenes, and pigeonites—are esent, post-intrusion fractional crystallization and gravitational differentiation ulting in a progressive enrichment of later-formed pyroxenes in iron, especially rked in the pigeonites. Magnesia-rich augite and orthopyroxene, of early ystallization and occurring in the lower parts of the sills, are incompatible with er-formed iron-rich augite and iron-magnesia pigeonite, in the upper parts. e behaviour and immiscibility of the pyroxenes are explained by reference to eir atomic structure. In the subjacent dike-like bodies, which did not form osed chambers' like the sills, there was a contrasted trend of differentiation wards an andesitic rock, explained by the gravitational removal of part of the roxene from the system. The author suggests that the form of the differentian chamber may control gravitational movement of solid phases of a crystallizing agma, and thus influence the trend; by this hypothesis he reconciles apparently nflicting views on the residual liquids of crystallizing basalt. C. F. D.

ROKSTRÖM (Torsten). *Some notes on the differentiation problem.* Bull. Geol. Inst. Univ. Upsala, 1943, vol. 30, pp. 103–116, 3 figs.

Discussion of variation diagrams in connexion with magmatic or crystallizan-differentiation, and a criticism of H. von Eckermann. L. J. S.

INN (Alonzo). *Settling of heavy minerals in a granodiorite dike at Bradford, Rhode Island.* Amer. Min., 1943, vol. 28, pp. 272–281, 4 figs.

A basal concentration of heavy minerals in a 65-foot dike is attributed to avitational settling. C. F. D.

OLGATE (Norman). *The Portencorkrie complex of Wigtownshire.* Geol. Mag. Hertford, 1943, vol. 80, pp. 171–195, 3 figs.

This small Caledonian complex, 4 square miles in area, consists of hypersthenic roxene-mica-diorite towards the margins, passing inwards into less basic oritic types formed by the crystallization-differentiation in situ of a pyroxeneca-diorite magma. A central core of adamellite has extensively hybridized the

adjacent diorite. Petrographical descriptions are given, with chemical analys and a comparison is drawn with other Scottish intrusions. The thermal m morphism of the surrounding Silurian shales and greywackes and of the p complex porphyrite dikes is discussed. C. F. D.

Zatokovenko (V. A.) Затоковенко (В. А.). *Essential features of the petrology the intrusive complex in the neighbourhood of the Yatyrgvarta mountain in northern Caucasus.* Compt. Rend. (Doklady) Acad. Sci. URSS, 1941, vol. pp. 651–653, 1 fig.

The wide range of rock types from bytownitite, through various gradation eucrite, gabbro, quartz-diorite, and granodiorite, to granite is attributed crystallization-differentiation of an initial gabbroic magma in a deep-seat magma reservoir, with some further differentiation after the successive intrusio from basic to acid magma. L. J. S.

Macdonald (Gordon A.). *The 1840 eruption and crystal differentiation in t Kilauean magma column.* Amer. Journ. Sci., 1944, vol. 242, pp. 177–18 1 fig.

The lava erupted from a higher level (about 3000 feet) is olivine-basalt wi very few small (1 mm.) phenocrysts of olivine; while that erupted two days lat from a lower level (about 800 feet) with abundant large (1 cm.) phenocrysts olivine is picritic basalt. Deducting 29% of porphyritic olivine from the com position of the latter rock, the composition is the same as that of the former roc L. J. S.

Benson (W. N.). *The basic igneous rocks of eastern Otago and their tectonic enviro ment, Part III. The olivine theralite of Waihola, east Otago, a gravitationally differentiated sill, with notes on related rocks.* Trans. Roy. Soc. New Zealan 1942, vol. 72, pp. 160–185, 1 pl., 3 text-figs.

A poorly exposed olivine-theralite sill, 50 feet thick, is more melanocratic i the lower modifications (SiO_2 40·50%, sp. gr. 2·91–3·0) than in the upper (SiO 43·14%, sp. gr. 2·777). The rocks are characterized by much deuteric alteration– zeolitization of felspar and nepheline, formation of iddingsite from olivine, & Associated olivine-basalts and basanites are described, as well as various nephelini rock-types from other New Zealand localities. In two appendixes, F. J. Turne tabulates data on the zoning of olivine and augite in these rocks, as indicated b variation in the optic axial angles; and C. O. Hutton reports on (I) a fibro zeolite (probably potash-rich thomsonite), positive, 2V 60°±5° but rarely 30° (II) titanaugite, positive, 2V 48–63°, both minerals from the olivine-theralit Analyses by F. T. Seelye. [M.A. **5**–219; **6**–295; **8**–234.]

	SiO_2.	TiO_2.	Al_2O_3.	Fe_2O_3.	FeO.	MnO.	MgO.	CaO.	BaO.	SrO.	Na_2O.	K_2O.
I.	42·10	0·03	26·87	0·21	0·36	0·03	0·35	5·16	nt. fd.	0·04	8·50	2·63
II.	45·28	2·88	7·60	2·45	7·48	0·18	10·31	22·45	nt. fd.	<0·01	0·60	0·07

	H_2O+.	H_2O-.	CO_2.	P_2O_5.	Cl.	S.	Total.	α.	β.	γ.	Sp. gr.
I.	11·35	2·57	nt. fd.	0·01	nt. fd.	—	100·21	1·5073	1·5095	1·5160	2·25–2·26
II.	0·26	0·12	nt. fd.	0·40	nt. fd.	0·02	100·16	1·698	1·704	1·724	3·425

II, with V_2O_3 0·047, NiO trace. C. F. D.

RRIAM (Richard). *Magmatic differentiation in gabbro sills near Ashland, Oregon.* Amer. Journ. Sci., 1945, vol. 243, pp. 456–465, 3 figs.

wo sills, each 140 feet thick, intrusive into Eocene sandstone show at the base top chilled margins (sp. gr. 2·76) 1–3 feet thick, and between these a gradual sition from a lower gabbroic zone into an upper dioritic zone, sp. gr. ranging –2·55 and the ratio femic/salic minerals 0·59–0·11. The core of the plagioclase nocrysts is 60% An throughout, while the rims range 45–30% An. The upper contains micropegmatite, hornblende, quartz, and, in vugs, calcite, zeolites, chlorite—all pointing to a separation of volatile constituents. There is no ence of assimilation of the wall-rock nor of separate intrusions, and the rentiation must have taken place after the emplacement. L. J. S.

ARITZKY (A. N.)] Заварицкий (А. Н.). Некоторые черты новейшего вулканизма Армении.—ZAVARITSKY (A. N.). *Some features of the Quaternary volcanism of Armenia.* Изв. Акад. Наук СССР, Сер. Геол. (Bull. Acad. Sci. URSS, Sér. Géol.), 1945, no. 1, pp. 28–39, 1 pl. (map), 3 text-figs. (Russian with English summary.)

he Quaternary volcanicity of Armenia, represented by andesite-basalt lavas dacitic tuffs, belongs to the areal type of eruptive activity, and it was charac- ed by alternations of Strombolian and Plinian types of eruption. This is buted to magmatic differentiation, viscous volatile-rich acid magma giving to the explosive phase and the fluid basic magma giving rise to the lava phase. arallel with Somma–Vesuvius cycle is drawn. S. I. T.

D (H. H.). *Meditations on granite: part one.* Proc. Geol. Assoc. London, 1943, vol. 54, pp. 64–85. *Part two.* Ibid., 1944, vol. 55, pp. 45–93, 1 pl. (Presidential addresses.)

thoughtful survey of the opinions of geologists and petrologists on granite the origin of granite, reviewing the writings on these subjects both of the masters, Hutton (1795) and Lyell (1830), and of the most modern authors. two is devoted to 'granitization'. The three classes of rocks are: '(1) *Nep*.—The sedimentary rocks, dominantly marine. (2) *Volcanic*.—Effusives associated intrusives; dominantly basic, magmatic, igneous; non-orogenic; prises the orthodox volcanic rocks plus related minor intrusions, sills, olites, etc., as of gabbro, dolerite, andesite, trachyte, etc.; crystallisation- rentiation may run in this class. (3) *Plutonic*.—Of two associated kinds, metamorphic rocks, and the ultra-metamorphic, migmatitic, metasomatic, itic rocks; orogenic; comprises the great granitic complexes, the gneisses and sts' (p. 93). W. C. S.

NG (Yu-Chi). *The migmatite area around Bettyhill, Sutherland.* Quart. Journ. Geol. Soc. London, 1944, vol. 99 (for 1943), pp. 107–154, 2 pls., 11 text-figs.

his is a study of the migmatitization of pelitic, semipelitic, siliceous, and blendic schists of the Moine Series in northern Scotland. From petrographical chemical investigation of series of specimens collected along the strike, the or establishes a lengthy sequence of changes that took place during the asomatism of the country-rocks to permeation-gneisses, augen-migmatites, various types of granite-gneisses. 'Many sheets of pegmatite, granite, and

aplite are shown by their field relations to have been formed by the grad metasomatism of the country-rocks, probably by the long-continued passag fluids along certain channels.' C. F. T

Reynolds (Doris L.). *Granitisation of hornfelsed sediments in the Newry gr diorite of Goraghwood quarry, Co. Armagh.* Proc. Roy. Irish Acad., Sec 1943, vol. 48, pp. 231–267, 9 figs.

A 60-foot wide band of hornfelsed sediment—dominantly diopside-hor with bands of cordierite-biotite-hornfels and plagioclase-biotite-hornfels—fo an enclave in granodiorite exposed by quarrying. Locally lenticles, veins, a irregular bodies of trondhjemite, granodiorite, adamellite, and granite-pegm replace the biotite-hornfelses, while the diopside-hornfels may be converte biotite-hornblende-plagioclase-hornfels, chemically equivalent to quartz-bio diorite. These replacements are all metasomatic, arising from a complex cyc geochemical migrations initiated by the introduction of Na, Ca, Si emanati from the granodiorites at the time of their crystallization. C. F. D

Reynolds (Doris Livesey). *The south-western end of the Newry igneous comp A contribution towards the petrogenesis of the granodiorites* Quart. Jo Geol. Soc. London, 1944, vol. 99 (for 1943), pp. 205–246, 2 pls., 7 text-fi

A further study of the derivation of various granodiorites at Newry, North Ireland, by granitization of sediments [preceding abstract]. It is suggested t biotite-granodiorite was developed from biotite-hornfels by introduction of N Ca, and Si, concomitant with the expulsion of material rich in Al, Fe, Mg, Ca, & which became fixed in a biotite-rich contact aureole and in basic to ultrabasic ro rocks. C. F. D

Rukavishnikov (F. I.) Рукавишников (Ф. И.). Материалы к характерист гранитов Сувундукского массива (ю. Урал).—*Materials for the characteris of granites of Suvunduk mass (the south Urals).* Изв. Акад. Наук CCC Сер. Геол. (Bull. Acad. Sci. URSS, Sér. Géol.), 1939, no. 5, pp. 128–14 1 pl., 2 text-figs. (Russian with English summary.)

A detailed petrographical description of granites and allied rocks of south Urals is given and eight modal and fifteen chemical analyses are included. short description of quartz-scheelite, gold, and wolframite veins is appended S. I. T.

Coetzee (C. B.). *The petrology of the Goodhouse-Pella area, Namaqualand, So Africa.* Trans. Geol. Soc. South Africa, 1942, vol. 44 (for 1941), pp. 167–20 6 pls., 8 text-figs.

The area described is a strip along the south bank of the Orange River (50 × miles) from Pella to Goodhouse. The principal formations consist of three pos Kheis granites, viz. an older granodiorite which is generally grey and massive a passes into biotite-granite, a younger granite-gneiss which is pink and coarse foliated, and an aplogranite probably derived from the latter. Rocks invaded b them consist of quartzite, gneiss, and amphibolite. Four analyses and norms a given of the granodiorite, and it is suggested that the biotite-granite is a hybri

'e analyses and norms are given for the granite-gneiss and one for the aplo-nite. Composition diagrams show that the older and younger rocks in general upy distinct fields. One of the younger granites contains rounded zircons of imentary origin, while another is apparently silicified by contamination. For nparison six new analyses and others of Cape granites are plotted on a varia-n diagram, and norms of various South African granites are plotted on ngular diagrams. The older Namaqualand granites are considered to be ated to the Old Granite of the Transvaal and the younger ones to the Old nite of Natal and Swaziland. E. D. M.

TTERSON (Edward M.). *Late-stage veins in the cone-sheet of Bloody Bridge, Mourne Mountains.* Irish Nat. Journ. Belfast, 1943, vol. 8, pp. 72–76.

A petrographical description is given of the late magmatic veins intersecting quartz-felspar-porphyry sheet of Tertiary age. A chemical analysis of a vein porphyritic granophyre is given. S. I. T.

TTERSON (Edward M.). *A xenolithic minor intrusion at Slievenagriddle, County Down.* Geol. Mag. Hertford, 1942, vol. 79, pp. 297–311, 1 pl., 2 text-figs.

A minor intrusion of chloritized markfieldite (granophyric spessartite) locally ntains abundant vein-quartz xenoliths, surrounded by felspathic rims of sup-sed metasomatic origin. Veins attributed to rheomorphism are associated with e xenoliths. From chemical and spectrographic analyses of markfieldite and a rheomorphic vein an increasing 'order of geochemical migration' (Li, Na, K,) is established for the alkali metals. C. F. D.

OLKVOI (O. S.)] Полквой (О. С.). Процессы контаминации в Аксоранской гранитной интрузии.—POLKVOY (O. S.). *The processes of contamination in the Aksoran granite intrusion.* Изв. Акад. Наук СССР, Сер. Геол. (Bull. Acad. Sci. URSS, Sér. Géol.), 1941, no. 6, pp. 60–71, 8 figs. (English summary, p. 71.)

The Aksoran granite, intrusive into limestone and lavas of upper Devonian and ver Carboniferous age, is situated 150 km. to the north of the town of Balkhash, azakhstan. According to the author the associated granodiorite, syenite, orite, and gabbro are the products of contamination of the granitic magma by e country-rocks. Eight chemical analyses of the rocks are given. S. I. T.

NG (Basil Charles). *The Cnoc nan Cuilean area of the Ben Loyal igneous complex.* Quart. Journ. Geol. Soc. London, 1943, vol. 98 (for 1942), pp. 147–185, 4 pls., 9 text-figs.

The late Caledonian igneous complex of Ben Loyal in northern Sutherland, otland, comprises three separate syenite intrusions, of which one mass, Cnoc n Cuilean, is here described in detail. It is formed of a central core of pulaskite d perthosite, with a marginal zone ranging from pulaskite to albite-shonkinite d pyroxenite, and bearing numerous 'basic patches' and aplitic or felspathic ns. A complicated metasomatic origin is postulated for the igneous rocks. e country-rocks, siliceous granulites of the Moine Series, are metasomatically ered to albite-granulites, aegirine-augite-schists, and hornblende-schists. Deep en aegirine-augite from metasomatized granulite gives SiO 51·40, TiO_2 0·01,

Al_2O_3 1·67, Fe_2O_3 4·32, FeO 8·10, MnO 0·27, MgO 10·60, CaO 21·98, K_2O tr., Na_2O 1·47, H_2O 0·29 = 100·11. C. F. D.

Davidson (Charles F.). *The Archaean rocks of the Rodil district, south Harris, Outer Hebrides.* Trans. Roy. Soc. Edinburgh, 1943, vol. 61, pp. 71–93, 3 pls., 1 text-fig. Price 6*s.* 3*d.*

A complex of high-grade para- and ortho-gneisses is described. Among the former are crystalline limestones and calc-silicate rocks with diopside, pargasite, spinel, forsterite, and phlogopite, chemical analyses of the first three minerals being given; garnet-kyanite-schists with cordierite (optically positive); graphite schists; and quartzites. These rocks are cut by basic to ultrabasic sheets metamorphosed to eclogite, garnet-amphibolite, and amphibolite; edenite-bearing peridotite, saxonite, and websterite; and both hypersthenic and garnetiferous basic charnockites. A mass of anorthosite-gneiss outcropping over 3 square miles is bordered by charnockitic metagabbros, both rock-types bearing frequent schlieren of eclogite and its retrograde equivalents, garnet-amphibolite and amphibolite. Later granite-pegmatites are worked for potash-felspar. The paragenesis of the rocks is discussed, with chemical analyses and with optical data on the component minerals; and the anorthosite-charnockite-eclogite assemblages are compared with similar pre-Cambrian suites from other lands, all of which are concluded to be of metamorphic rather than of metasomatic or magmatic (piezocrystalline) facies. C. F. D.

Combe (A. D.) & Holmes (Arthur). *The kalsilite-bearing lavas of Kabirenge and Lyakauli, south-west Uganda.* Trans. Roy. Soc. Edinburgh, 1945, vol. 61 (pt. 2, no. 14), pp. 359–379, 1 pl., 3 text-figs.

These lava-flows in the north-west corner of the Bunyaruguru volcanic field [map, Min. Mag. **26**–198] consist of composite members of the kalsilite-ugandite-mafurite and kalsilite-melilite-ugandite—melilite-mafurite series, modified by assimilation of granite, pyroxenite, &c. L. J. S.

Holmes (Arthur). *Leucitized granite xenoliths from the potash-rich lavas of Bunyaruguru, south-west Uganda.* Amer. Journ. Sci., 1945, vol. 243A (Daly volume), pp. 313–332, 1 pl., 2 text-figs. (maps).

Xenoliths of granite in olivine-rich ugandite from the Kariya crater, north-east corner of the Bunyaruguru volcanic field [map, Min. Mag. **26**–198], are rimmed by leucite, and with progressive assimilation the host rock is converted into olivine-leucitite and leucitite. L. J. S.

Basnett (Elizabeth M.). *Studies in metamorphism and assimilation in the Wellington district, N.S.W. II. The dynamic and contact metamorphism of a group of ultrabasic rocks.* Journ. Proc. Roy. Soc. New South Wales, 1943, vol. 76, pp. 55–81, 10 figs.

Lamprophyre sills have been in part subjected to intense dynamic metamorphism due to faulting, followed locally by contact metamorphism from neighbouring granite. The petrography of the original rocks and of their metamorphic derivatives is described, with chemical analyses indicating migration or diffusion of oxides during shearing. C. F. D.

PMAN (Randolph W.). *"Pseudomigmatite" in the Piedmont of Maryland.* Bull. Geol. Soc. Amer., 1942, vol. 53, pp. 1299–1330, 6 pls., 6 text-figs.

ıe term 'pseudomigmatite' is applied to a migmatite-like gneiss at Laurel, yland, composed of quartz, oligoclase, biotite, and muscovite, and believed ıve originated by the granulation, flowage, and recrystallization of oligoclase- -schist. C. F. D.

ARDI (P.). *La prehnitizzazione dei calcari metamorfici dell'Ordoviciano superiore sardo.* Periodico Min. Roma, 1941, vol. 12, pp. 161–174, 1 pl., 2 text-figs.

band of limestone in shales penetrated by granite-porphyry in the Solemnis ict, Sardinia, shows recrystallization of calcite and development of wolla- ite, diopside, grossular (biaxial in sectors, n 1·75, $\gamma-\alpha$ 0·005), epidote, and masses of prehnite (SiO_2 44·35, Al_2O_3 24·11, Fe_2O_3 1·90, CaO 26·04, H_2O = '100·48'). L. J. S.

SON (Kenneth DeP.). *Zoisite-prehnite alteration of gabbro.* Amer. Min., 1942, vol. 27, pp. 638–645, 5 figs.

etagabbro formed of saussuritized plagioclase and uralitized pyroxene, rring in the Baie Verte district, Newfoundland, is locally altered to zoisite- nite-rock. Chemical analyses indicate that the alteration, believed to be othermal, was accompanied by a marked increase in lime (from 14·40 to 2%), and slight decrease in silica, iron, magnesia, and alkalis. C. F. D.

)LEV (N. D.). *Ferric iron as an index of the degree of serpentinization of ultra-basic rocks.* Compt. Rend. (Doklady) Acad. Sci. URSS, 1944, vol. 42, pp. 301–303.

)ur analyses of fresh peridotite from the Caucasus and of rocks in various es of serpentinization show FeO 6·96–0·43%, Fe_2O_3 0·71–7·14%. The wing reaction is suggested: $2Mg_3Fe(SiO_4)_2+4H_2O+CO_2 = 2H_4Mg_3Si_2O_9+$ $)_3+CO$. L. J. S.

OGLIO (Massimo) & SANERO (Edoardo). *I giacimenti di magnesite delle prealpi Piemontesi.* Periodico Min. Roma, 1941, vol. 12, pp. 83–126, 7 pls.

)mpact, white magnesite occurs with opal veinlets and stringers in lherzolite)art altered to serpentine) at Baldissero hill, south-west of Ivrea, and at te Musinè, north-west of Torino. Fresh lherzolite gave SiO_2 42·78, TiO_2 0·34, $_3$ 3·86, Cr_2O_3 0·37, Fe_2O_3 1·50, FeO 6·82, MnO 0·04, NiO 0·24, CoO trace, 38·06, CaO 3·61, Na_2O 0·88, K_2O 0·28, S 0·02, H_2O+ 0·79, H_2O- 0·26 = 5 (ZrO_2, BeO, SrO, BaO, P_2O_5, V_2O_5 absent). Analyses are also given of entine (NiO 0·35%). The purest magnesite gave CO_2 51·45, MgO 47·53, $_3$ 0·06, Fe_2O_3 0·05, CaO 0·26, H_2O+ 0·48, H_2O- 0·13 = '100·17'; other yses show 8·31–9·80 insoluble, which the X-ray pattern shows to be opal. y photographs are given of magnesite, opal, and serpentine. L. J. S.

Edwards (A. B.) & Baker (G.). *Contact phenomena in the Morang Hills, Victo*
Proc. Roy. Soc. Victoria, 1944, n. ser., vol. 56, pp. 19–34, 5 figs.

The aureole around granodiorite intrusive into Silurian mudstones and sh
shows at 300 yards from the contact spotted muscovite-hornfels, passing i
biotite-hornfels, and at 200–250 yards cordierite-biotite-hornfels. In one por
of the aureole, evidently where the original mudstones contained less chlor
sillimanite-andalusite-hornfels rich in orthoclase is developed. The grain-si
quartz increases from 0·04 mm. at 300 yards to 0·8 mm. at the contact.
granodiorite (anal. I) shows a marginal porphyritic phase (II) with large (3 in
crystals of orthoclase containing perthitic intergrowths of albite and poik
enclosures of biotite, oligoclase, quartz, andalusite, &c. Xenoliths of the se
mentary rocks in the granodiorite show a development of orthoclase, oligoc
hornblende, and biotite.

	SiO_2.	TiO_2.	Al_2O_3.	Fe_2O_3.	FeO.	MnO.	MgO.	CaO.	Na_2O.	K_2O.	P_2O_5.	F
I.	69·17	0·77	15·95	0·88	3·64	0·03	1·12	3·04	2·64	3·07	0·02	0
II.	66·30	0·44	16·42	0·52	3·00	0·05	1·05	1·85	2·65	6·00	1·12	0·4

I, total 100·69, sp. gr. 2·66; II, total 99·82, sp. gr. 2·67.

L. J. S

Switzer (George). *Eclogite from the California glaucophane schists.* Amer. Jou
Sci., 1945, vol. 243, pp. 1–8.

Eclogite occurring as small outcrops in the glaucophane-schists has been form
by the hydrothermal contact metamorphism of basalt near peridotite (serpenti
intrusions under conditions of moderate temperature and pressure. The avera
composition is omphacite 57, garnet 28, glaucophane 2, hornblende 3, chlorite
sphene 4, rutile 2%; pumpellyite, lawsonite, and some other minerals are a
present. Omphacite from Healdsburg, Sonoma Co., has sp. gr. 3·34, α 1·6
β 1·679, γ 1·691, 2V 60°, positive, $\beta = b$, $\gamma : c = 39°$; analysis by F. A. Gon
gave SiO_2 53·31, TiO_2 0·26, Al_2O_3 10·52, Fe_2O_3 4·11, FeO 2·84, MnO 0·05, M
8·42, CaO 14·50, Na_2O 5·90, K_2O 0·05, H_2O+ 0·16 = 100·12. Analysis of
garnet [M.A. 5–72].

L. J. S

Jayaraman (N.). *A kyanite-garnet-mica schist from Saidapuram, Nellore.* Jou
Indian Inst. Sci., 1940, vol. 23A, pp. 47–52.

Kyanite (anal. I) forms the bulk (up to 80%) of the rock; it is usually gre
but in part blue, and contains inclusions. The garnet (II and III) varies
composition, almandine predominating; n 1·79–1·81. Staurolite (IV) as g
crystals, $a : b : c = 0·4751 : 1 : 0·6836$, α 1·7357, β 1·7402, γ 1·7448, sp. gr. 3·96
Brown hornblende has $\gamma : c = 19\frac{1}{2}°$, sp. gr. 3·2931. Black tourmaline is r
sp. gr. 3·1146. Quartz and muscovite are also main constituents, and magneti
sphene, ilmenite, and zircon are minor constituents.

	SiO_2.	TiO_2.	Al_2O_3.	Fe_2O_3.	FeO.	MnO.	MgO.	CaO.	H_2O.	Total
I.	36·55	0·20	62·72	0·29	0·36	—	trace	0·31	—	100·
II.	37·54	—	22·29	5·43	21·92	3·49	7·52	1·15	—	99·
III.	36·35	—	20·71	4·68	23·97	13·03	0·20	1·33	—	100·
IV.	27·81	—	54·97	2·16	12·67	0·31	0·23	0·12	1·57	99·

L. J. S

ERS (T. W.) & DUNNE (J. C.). *Charnockitic rocks near Port Edward in Alfred County, Natal.* Trans. Geol Soc. South Africa, 1943, vol. 45 (for 1942), pp. 183–214.

Rocks occurring just north of Port Edward comprise hypersthene-quartz-ite, granodiorite, quartz-monzonite, and charnockite. In addition to quartz felspar, they contain iron-rich hypersthene, diopside, hornblende, biotite, niferous magnetite, apatite, zircon, and almandine. Associated with them ur garnet-granulites in part also hypersthene-bearing. Four analyses by ne are given and it is suggested that these rocks are derived partly from inal sediments. E. D. M.

ARAMAN (N.). *On the origin of the charnockites.* Journ. Indian Inst. Sci., 1940, vol. 23A, pp. 21–24.

From the mosaic structure of the quartz grains and the arrangement of the losed needles of rutile [M.A. **8**–136, 526] it is concluded that the charnockites of magmatic origin and that they suffered a slight metamorphism during the r stages of consolidation of the magma. They are mainly crystalline intrusives he peninsula gneiss. L. J. S.

RNER (Francis J.) & HUTTON (C. Osborne). *Some porphyroblastic albite-schists from Waikouaiti river (south branch), Otago.* Trans. Roy. Soc. New Zealand, 1941, vol. 71, pp. 223–240, 3 pls., 5 text-figs.

Quartz-albite-muscovite-schists grading into chlorite-schists and belonging to chlorite zone of metamorphism contain porphyroblasts (2–3 mm. across) of ite (impregnated with dusty iron-ore) which stand out as black knobs on ithered surfaces. Optical data and petrofabric diagrams are given for the eral minerals. The albite shows no preferred orientation. L. J. S.

ETZEE (C. B.). *Metamorphosed sediments from the Goodhouse-Pella area, Namaqualand, South Africa.* Trans. Roy. Soc. South Africa, 1942, vol. 29, pp. 91–112, 1 pl., 5 text-figs.

A description is given of xenoliths of sedimentary origin found in granite. In ition to varieties previously reported [Min. Mag. **26**–134; M.A. **8**–321], se include sillimanite-augen-gneisses, sillimanite-quartz nodules, recrystallized rtzites, injected biotite-gneisses, and amphibolites. C. F. D.

ARAMAN (N.). *The occurrence and geochemical origin of the dolomite marble of Yellandu, Singareni (Warangal district, Hyderabad, Deccan).* Journ. Indian Inst. Sci., 1940, vol. 23A, pp. 36–43, 1 fig. (map).

Six analyses of white, grey, and yellow marbles from different quarries show O 30·50–51·14, MgO 21·16–3·38, Fe_2O_3 0·64–0·93, H_2O 0·09–0·17, insol. 0·28–7%. The older beds are more dolomitic than the younger. L. J. S.

ORZHINSKY (D. S.)] Коржинский (Д. С.) KORJINSKY (D. S.). *Deposits of metasomatic contact reaction.* Compt. Rend. (Doklady) Acad. Sci. URSS, 1941, vol. 33, pp. 133–135, 3 figs.

These include: (1) Skarn deposits of various mineralization at the contact of estones and silicate rocks. (2) Desilicified pegmatites at the contact of hyper-

basites and felspar rocks; e.g. corundum-plagioclasites, emerald deposits, a certain vermiculite, talc, nephrite, and jadeite deposits. (3) Phlogopite-apat and lazulite deposits at the contact of dolomite and felspar rocks. Diagra show the transitional changes from one rock to the other. L. J. S.

Astashenko (K. I.) Асташенко (К. И). *Alunite-bearing secondary quart i in the central Balkhash region.* Compt. Rend. (Doklady) Acad. Sci. URS 1940, vol. 27, pp. 142–146.

The secondary quartzites, outcropping as many knolls near the contac granodiorite and acid effusive rocks, owe their origin to the action of H_2S (from SO_2 or H_2S) on the effusive rocks. They contain up to 40% of alun disseminated as small scales throughout the rock, with associated andalu corundum, dumortierite, diaspore, &c. L. J. S.

Astashenko (K. I.) Асташенко (К. И.). *Secondary quartzites of central Balkh region.* Compt. Rend. (Doklady) Acad. Sci. URSS, 1940, vol. 27, pp. 477–48

Large bodies of quartzite formed by hydrometamorphism and pneumatolyt metamorphism of granodiorite-porphyry contain a variety of minerals—andal site, dumortierite, corundum, diaspore, alunite, zunyite, molybdenite, chalc pyrite, &c.—and would be of use for refractories. L. J. S.

Ambrose (J. W.). *Brucitic limestones and hastingsite syenite near Wakefiel Quebec.* Trans. Roy. Soc. Canada, 1943, ser. 3, vol. 37, sect. 4, pp. 9–2 3 figs.

Brucite limestones of Grenville age form numerous roof pendents in 4 squa miles of hastingsite-syenite on both sides of Gatineau river. Thirteen comple analyses of the limestone show 20–30% brucite. The syenite partially engulfe the original dolomitic limestone and caused periclase, forsterite, diopside, &c to form, and then supplied water to change periclase to brucite and forsterite t antigorite. M. A. P.

Fellows (Robert E.). *Recrystallization and flowage in Appalachian quartzit* Bull. Geol. Soc. Amer., 1943, vol. 54, pp. 1399–1431, 12 pls., 5 text-figs.

This is a petrofabric study of the (?) pre-Cambrian to Mississippian quartzit of the central Appalachians. Towards the north, north-west, and west the rock pass from metamorphosed to undeformed types, the approximate geographic and stratigraphical limits of visible deformation being determined and th development of the preferred orientations described. C. F. D.

Pichamuthu (C. S.). *Tourmaline schists from Holenarsipur, Hassan distric Mysore state.* Current Sci. Bangalore, 1944, vol. 13, pp. 279–280, 1 fig.

Dull black, compact fragments found loose in the neighbourhood of granit consist entirely of minute prisms of tourmaline mostly in parallel orientatio Sp. gr. 3·12, ϵ 1·630, ω 1·662. Spectrographic analysis showed the presence lithium, indicating the schorlite-elbaite series. L. J. S.

WARTZ (George M.). *Metamorphism of extrusives by basic intrusives in the Keweenawan of Minnesota.* Bull. Geol. Soc. Amer., 1943, vol. 54, pp. 1211–1225, 2 pls., 1 text-fig.

description of hornfelses produced through the thermal metamorphism of veenawan basalt and rhyolite by the Duluth gabbro. Characteristic plagio-e-pyroxene-ilmenite-granulites derived from basalt show a relative enrich-it in TiO_2 and FeO, added from the gabbro. C. F. D.

NTSCHEL (H.). *Die kalksilikatischen Bestandmassen in den Gneisen des Eulenge-birges (Schlesien).* Min. Petr. Mitt. (Tschermak), 1943, vol. 55, pp. 1–136, 1 pl., 32 text-figs.

he paragneisses of the Eulengebirge, southern Silesia, contain syngenetic aves, up to about a cubic metre in size, of hessonite-quartz-granulite pyroxene), which grade into the surrounding biotite-gneiss through a double tion rim consisting of: (1) pyroxene, anorthitic plagioclase, and quartz, ornblende and almandine; (2) hornblende, medium plagioclase, and quartz, lmandine. The various mineral assemblages are attributed to a process of amorphic differentiation ('mesitis'). Four analyses are given of grossular, and of almandine. C. F. D.

DONALD (Gordon A.). *Unusual features in ejected blocks at Kilauea volcano.* Amer. Journ. Sci., 1944, vol. 242, pp. 322–326, 1 fig.

locks of picritic basalt which had been torn from the walls of the conduit of volcano show metamorphic effects; pigeonite is altered to hypersthene and ite; olivine phenocrysts are rimmed or impregnated with magnetite; and the ndmass has a hornfels texture. L. J. S.

DY (L. F.) & WEBB (Robert W.). *Cored bombs from Arizona and California volcanic cones.* Journ. Geol. Chicago, 1943, vol. 51, pp. 398–410, 9 figs.

ombs consisting of an envelope of basaltic scoria and a xenolithic core are id around cinder cones in the San Francisco mountains in Arizona. The s are of various types of sedimentary and igneous (alaskite to dunite) rocks. andstones there is a development of tridymite; and in granite the orthoclase inverted to sanidine. The bombs are usually spindle- or almond-shaped; some y 'ears' ('tails') with air pockets, due to the breaking up of a chain of bombs. e smaller bombs have an equatorial flange [cf. australites]. L. J. S.

ARITZKY (A. N.)] Заварицкий (А. Н.). Основной вопрос физической химии процесса образования пегматитов.—ZAVARITSKY (A. N.). *The principles of physical chemistry in the process of pegmatite formation.* Изв. Акад. Наук СССР, Сер. Геол. (Bull. Acad. Sci. URSS, Sér. Géol.), 1944, no. 5, pp. 12–40, 12 figs. (Russian with English summary.)

his is a critical discussion of the pressure-temperature-composition equili-m diagram for two or three components one of which is volatile at low perature. The principal aim of the author is to demonstrate that the so-called t–Niggli temperature-composition diagram does not represent an isobaric ion of the PTX diagram. With the help of thermodynamic potential a correct

diagram is constructed and this diagram is then used for the interpretation of process of pegmatite formation. The possibility of recrystallization leadin the formation of coarse-grained pegmatites and the possibility of retrogr boiling on lowering the pressure are also discussed. S. I. T

Uspensky (N. M.). *On the genesis of granitic pegmatites.* Amer. Min., 19 vol. 28, pp. 437–447, 2 figs.

Pegmatite veins cutting granite at 'Gold Mountain', Borshov range, 120 k south of Nerchinsk, Transbaikalia, show a bilateral symmetry with zones rang from marginal aplite through graphic granite and a coarse-grained qua felspar aggregate ('pegmatoid') to central druses of morion and orthoc with cleavelandite. The pegmatites have arisen by pneumatolytic-hydrothe transformations of aplite dikes under the influence of 'aqueous silic alkaline solutions containing a little fluorine'. The author concludes granophyre and graphic granite are in general the products of metasom activity. C. F. D

Bulashevich (Y. P.) Булашевич (Ю. П.). Применение радиоактивного мет для поисков пегматитов в полосе щелочных пород Урала.—*A radioa method of pegmatite search in the alkaline rocks of the Urals.* Изв. Ак Наук СССР, Сер. Геол. (Bull. Acad. Sci. URSS, Sér. Géol.), 1944, no. pp. 28–35, 3 figs. (Russian with English summary.)

Through the application of the ionization camera it was found that pegmat dikes could be easily located in the field, and that the margins of the di showed the highest radioactivity. The radioactive elements were chiefly co centrated in zircon and pyrochlore. S. I. T

Adamson (Olge J.). *The granite pegmatites of Hitterö, southwestern Norw* Geol. För. Förh. Stockholm, 1942, vol. 64, pp. 97–116, 2 figs. (maps).

The small island of Hitterö (renamed Hidra, 21 sq. km., 58° 14′ N.) consi of anorthosites (andesinefels), a belt of fine-grained rocks ranging from gran to olivine-gabbro, and an area of charnockite. Granite-pegmatite, famous many rare minerals, is present only in the andesinefels. Details are given of t felspar quarries, the largest and most important being Igletjern. The miner described are microcline, oligoclase, quartz, biotite, muscovite, spessartine, be gadolinite (crystals up to 40 cm. long, always metamict, sp. gr. 4·02), orth (sp. gr. 3·50, β 1·70; sp. gr. 3·28, β 1·67), kainosite (sp. gr. 3·43–3·49), zirc (including malacon and alvite), thorite (sp. gr. 4·21), euxenite minerals (relations of the euxenite-polycrase and priorite-blomstrandine series are d cussed), aeschynite(?), apatite, monazite, xenotime, magnetite, ilmenite, a molybdenite. Their order of crystallization is discussed, and the rare-eart present in them were determined by X-ray spectroscopic analysis. L. J. S.

Quirke (T. T.) & Kremers (H. E.). *Pegmatite crystallization.* Amer. Min., 194 vol. 28, pp. 571–580, 1 fig.

Discussion on the concentration of rarer elements and volatiles in the residu liquors, complexity and saturation of solutions, deposition, re-solution, and r

cements, speed of flow along channels of varying width with consequent nperature gradients, and conditions for the growth of large crystals.

L. J. S.

IRKE (T. T.) & KREMERS (H. E.). *Rare element prospecting in pegmatites.* Econ. Geol., 1943, vol. 38, pp. 173–187.

The search for minerals of the rare elements in pegmatites might be aided by ctrographic analyses of certain commoner 'test minerals': apatite and high-nperature epidote for the rare-earths; zircon for Th, &c.; sphene for Nb and ; lepidolite for the rare alkalis; ilmenite for V. M. A. P.

GLIANI (G.) & MARTINENGHI (M.). *Il filone pegmatitico di Montescheno in Val Antrona (Ossola).* Periodico Min. Roma, 1941, vol. 12, pp. 49–82, 2 pls., 4 text-figs.

Detailed chemical analyses and optical and crystallographic data are given for several minerals—orthoclase, albite, oligoclase, muscovite, beryl (new crystal-ms (31$\bar{4}$0) and (32$\bar{5}$0), $a : c = 1 : 0{\cdot}499$), garnet, &c. The pegmatite shows good phic structure, contains 4–5% of beryl, and has yielded good quality musco-e. Enclosed blocks of peridotite show a zonal alteration to biotite and talc.

L. J. S.

MESURIER (C. R.). *Minerals occurring in a felspar deposit, Londonderry, and in vicinity of Tantalite Hill.* Western Australia, Report of the Government Mineralogist and Analyst for the years 1941 and 1942, 1944, Appendix II, p. 18, 1 pl. (sketch-plan).

Lithium-bearing minerals in pegmatites, which are quarried for microcline by Australian Glass Manufacturers, are petalite, lepidolite, and zinnwaldite. ryl, topaz, spessartine, manganocolumbite, pucherite (bismuth vanadate), tonite, muscovite, and albite are also recorded. W. C. S.

CORA (William T.). *Nepheline syenite pegmatites, Rocky Boy stock, Bearpaw Mountains, Montana.* Amer. Min., 1942, vol. 27, pp. 397–424, 12 figs.

Unusual nepheline-syenite pegmatites are found as segregation knots, lens-ped bodies, and dikes in the nepheline-syenites, monzonites, and shonkinites the composite Rocky Boy stock, of Tertiary age. Among the minerals present sanidine, potassic nepheline (I), sodalite, biotite, fibrous aegirine (II), smatic aegirine, melanite, eudialyte, catapleiite, lamprophyllite (III), and elpidite. A comparison is drawn with the pegmatites of the Kola peninsula.

SiO_2.	TiO_2.	Al_2O_3.	Fe_2O_3.	FeO.	MnO.	MgO.	CaO.
41·52	nil	34·09	0·79	—	—	—	0·06
51·72	1·32	1·56	26·14	2·38	0·21	1·41	2·56
30·92	31·73	0·32	0·97	2·90	2·01	0·31	1·68

Na_2O.	K_2O.	BaO.	SrO.	ZrO_2.	F.	H_2O+.	Total (−O = F_2).
15·76	6·85	0·03	nil	—	—	0·55	99·65
11·28	0·34	—	—	0·24	—	0·50	99·66
10·64	0·99	1·12	14·66	—	1·71	1·07	100·17

The optical properties are: I, ω 1·543, ϵ 1·539; II, α 1·757, β 1·786, γ 1·79 negative, 2V 62°, dispersion $r > v$; III, α 1·746, β 1·754, γ 1·778, positive, β = near a, $\gamma : c = 5°$, pleochroism deep yellow to honey-yellow, absorption $\gamma >$ dispersion $r > v$ strong, sp. gr. 3·46. C. F. D.

Webb (Robert W.). *Two andalusite pegmatites from Riverside County, Californ* Amer. Min., 1943, vol. 28, pp. 581–593, 3 figs.

Pegmatites with andalusite, corundum, microcline, and quartz are descri from Coahuila Mountain and Winchester. Bundles of andalusite crystals re up to 15 inches in length and 5 inches thick. One occurrence is thought to due to metamorphism of aluminous sediments, and the other to metamorphic differentiation. L. J. S.

Shand (S. J.). *The present status of Daly's hypothesis of the alkaline rocks.* Am Journ. Sci., 1945, vol. 243A (Daly volume), pp. 495–507.

The views of various authors for and against Daly's hypothesis (1910) of desilicification of magmas by assimilation of limestone with the production alkalic rocks are reviewed. 'The assumption of a "carbonate magma" is believe to be untenable.' [M.A. **5**–223.] L. J. S.

Larsen (Esper S.). *Alkalic rocks of Iron Hill, Gunnison County, Colorado.* Pro Paper U.S. Geol. Surv., 1942, no. 197A, v+64 pp., 3 pls., 9 text-figs. Pric 40 cents.

The Iron Hill stock is formed of a varied assemblage of rock-types very lik those of the Fen district of Norway. It underlies an area of 10 square miles, intrusive into pre-Cambrian granite, and overlain by late Jurassic sandstone The oldest rock present is a mass of dolomite over a mile in diameter, tentativel believed to be a large hydrothermal deposit in the throat of a volcano, bu possibly representing either a carbonate magma or an inclusion of pre-Cambria marble. The oldest igneous rock is a giant- to coarse-grained uncompahgrit (melilite-rock), of grain size up to 0·5 metre and forming masses up to half square mile in extent. The next intrusion, principally pyroxenite, occupies 70% o the area of the stock, and ranges from diopside-rock to biotitite, with perovskite magnetite-rock, apatite-perovskite-rock, and other types. This in turn is cut b very variable and coarse-grained nepheline-perovskite-melanite assemblage (ijolite), and the last followed by banded or gneissoid soda-syenite and nepheline syenite. The latest intrusions are dikes of nepheline-gabbro and quartz-gabbro one of which at least is composite and contains both rocks. Almost all these rock types are locally altered by hydrothermal solutions, with the deposition o melanite, idocrase, diopside, cebollite, juanite, and other minerals in the un compahgrite, and with the widespread introduction of aegirine and soda-amphi bole, with or without phlogopite and other minerals, into the carbonate rocks. I a section on mineralogy, by Larsen and William F. Jenks, a large number of rock and mineral analyses are listed, analysed minerals including juanite, cebollite cancrinite and sulphatic cancrinite, natrolite, and a wide range of sodic amphi boles (soda-tremolite—glaucophane) and diopside—acmite pyroxenes, curves showing the variation of optical properties with composition being given for the last two groups. The differentiation is attributed to reaction of a basaltic magma

marble, followed by crystal fractionation. A section on the rare chemical stituents of the rocks and minerals, by Larsen and George Steiger, completes report. [M.A. **5**–146.] C. F. D.

) (B. Rama). *The rare occurrence of melilite-diopside-nepheline association in a calciphyre near Nanjangud, Mysore.* Current Sci. Bangalore, 1943, vol. 12, p. 54.

– *A preliminary note on the melilite nephelite calciphyres and other variants formed from the gabbro-limestone reactions, near Nanjangud, Mysore.* Rec. Mysore Geol. Dept., 1943, vol. 41, pp. 18–45, 2 pls.

ands of calciphyre, ranging from coarsely crystalline white marble to compact flintas, occur in intrusive hornblende-gabbro. They have been subjected to amic and thermal metamorphism as well as pneumatolytic and hydrothermal on from adjacent granite, with development of the following minerals (for e of which only tentative determinations are given): nepheline, kaliophilite, ite, melilite, haüyne, monticellite, merwinite, spurrite, larnite, scapolite, burite, zoisite, xonotlite, wollastonite, garnet, &c. Chemical analyses are n of the rocks. L. J. S.

ıвın (Y. A.)] Билибин (Ю. А.). Петрография Алдана. Послеюрские интрузии Алданского района. [*The petrography of Aldan. Post-Jurassic intrusions of the Aldan district.*] Петрография СССР, Сер. I, Вып. 11 [10 on cover], Петр. Сектор, Инст. Геол. Наук, Акад. Наук СССР (Petrography of the USSR, Ser. 1, Fasc. 11 (10), Petr. Div., Inst. Geol. Sci., Acad. Sci. USSR), 1941, 164 pp., 7 pls. Price 12 r. (Russian.)

he igneous rocks of the Aldan district (58–59° 20′ N., 124–127° W.) form a ographical province akin to that of central Montana, U.S.A. Five large oliths, the largest over 100 sq. km. in area, and a host of smaller intrusions present. Among the many rock-types described are porphyritic and aphyric nolites and related rocks with pseudoleucite and epileucite [M.A. **6**–418], ıdoleucitites, trachyandesites, and trachybasalts, orthoclase-andesites and alts, pseudoleucite- and nepheline-syenites (including malignite-foyaites and ıkinites), alkalic syenites (aegirine- and melanite-syenites, larvikites, and skites), augite-syenites, syenodiorites, and diorites, and aegirine-granites. e rocks comprise zeolitic and pseudoleucite-tinguaites, sölvsbergites, boston- grorudites, &c. Fifty-five rock analyses are listed. The differentiation is ussed at length, the genesis of the undersaturated alkalic magma being atively attributed to a combination of limestone-assimilation, volatile- sfer, and tectonic factors. Unfortunately no geological map of the intrusions ovided. C. F. D.

KANOV (A. A.). *On a new deposit of nephelite rocks in the north-western part of the Kola peninsula.* Compt. Rend. (Doklady) Acad. Sci. URSS, 1945, vol. 46, pp. 72–74, 1 fig. (map).

ıvite, composed of nepheline, diopside-aegirine, and biotite, with some albite, been found in situ at lake Kumojie, 15–20 km. SSE. of the massif of alkalic

rocks of Gremyakha-Vyrmes [M.A. 7–35; 8–18]. Boulders of aegirine-nepheli syenite are found along the Kola river. L. J. S.

Polkanov (A. A.) Полканов (А. А.). К вопросу гетерогенности фойяит 1. Гетерогенность магматических фойяитов.—*Problems of the heterogeneit the foyaites.* 1. *The heterogeneity of the magmatic foyaites.* Изв. Акад. На СССР, Сер. Геол. (Bull. Acad. Sci. URSS, Sér. Géol.), 1944, no. 5, pp. 1 50, 1 fig. (Russian with English summary.)

The study of the rock-series of the igneous complex of Gremyakha-Vyrm Kola peninsula, lends support to Bowen's hypothesis of alternative line crystallization of magmas [M.A. 7–33]. The first series proceeds from ga through alkali-syenite to foyaite, the second series from urtite through ijo malignite, and juvite to foyaite. This suggests that foyaite can be formed f residual melts of different types of magmas, as well as from the magma-limesto syntectic. S. I. T.

[Ivensen (Y. P.)] Ивенсен (Ю. П.) Ivensen (J. P.). *On the alkaline rocks of t Kovdor-Ozero region of the Kola peninsula.* Compt. Rend. (Doklady) Aca Sci. URSS, 1941, vol. 30, pp. 337–339.

The alkalic rocks of the Kovdor lake region, south-west Kola peninsula, are mo closely related to those of the Turya peninsula [M.A. 6–424] and the Fen distr in Norway than to those of Khibina, Kola. An ijolite magma oversaturated wi lime from assimilated limestones reacted with the gneisses producing alkali cancrinite-, and nepheline-syenites with magmatic calcite. Later intrusions of t ijolite magma into the already syenitized gneisses gave ijolite-urtite rock Chemical analyses show the transition from ijolite through syenite and syenitize gneiss to gneiss. L. J. S.

[Gerasimovsky (V. I.)] Герасимовский (В. И.) Gerassimovsky (V. I.). *On t rôle of zirconium in minerals of nepheline-syenite massifs.* Compt. Ren (Doklady) Acad. Sci. URSS, 1941, vol. 30, pp. 820–821.

Nepheline-syenites are divided into two groups—miaskite and agpaite according as the ratio of the number of $Al_2O_3/(K_2O+Na_2O)$ molecules is great or less than unity. Zircon is characteristic of the first type and complex zircon silicates (eudialyte, &c.) of the second. But an exception to this is the occurren of zircon in rocks of the agpaite type at Mariupol. Rather the percentage silica in the rock would appear to be the controlling factor, zirconium acting as cation ($ZrSiO_4$) in a more acid environment and as an anion in a less acid enviro ment. L. J. S.

[Eliseev (N. A.) & Sverzhinskaya (E. A.)] Елисеев (Н. А.) и Свержинска (Е. А.). Eliseev (N. A.) and Sverjinskaya (E. A.). *Chemical compositio of Lovozero eudialytites.* Compt. Rend. (Doklady) Acad. Sci. URSS, 194 vol. 31, pp. 244–245.

Pink, red to almost black, medium grained rocks, occurring as irregular pocket in eudialyte-lujavrite, consist mainly of eudialyte (61–75%) with nepheline felspars, aegirine, &c. Detailed chemical analyses of these eudialytites sho SiO_2 50, ZrO_2 7, Na_2O 10%, &c. L. J. S.

FF (John C.). *Alkaline vitrophyre dike, Cape Neddick, Maine.* Amer. Min., 1943, vol. 28, pp. 426–436, 1 pl., 2 text-figs.

The dike described, 5–8 inches thick, is glassy (n 1·535) with phenocrysts of nblende and plagioclase (Ab_{67-70}) and with pronounced flow-banding, skeletal stals, and incipient spherulitic structures. The chemical analysis relates it to ordmarkitic magma type. C. F. D.

RSSON (Walter). *Petrology of interglacial volcanics from the Andes of northern Patagonia.* Bull. Geol. Inst. Univ. Upsala, 1941, vol. 28, pp. 191–405, 2 pls., 60 text-figs.

Description with eight chemical analyses of a collection of lavas and pyroclastic ks from the cerro Tronador and lake Nahuel Huapi areas. They include vine-basalts and olivine-free basalts of various types grading through pyroxene-iesites to hornblende-dacites. Statistical studies were made of the pheno-sts of plagioclase, olivine, hypersthene, and clinopyroxene, with plots against chemical composition (as deduced from measurements of the optic axial gles). The optical orientations of the plagioclase agree better with the curves Nikitin than with those of Berek and Reinhard. L. J. S.

NDEGÅRDH (Per H.). *The Grovstanäs region, an ultra-basic gabbro massif and its immediate vicinity.* Bull. Geol. Inst. Univ. Upsala, 1943, vol. 29, pp. 305–388, 2 pls., 31 text-figs.

The rocks described, with chemical analyses, from this area 55 km. north-east of ckholm, include anorthosites, allivalites, peridotites, eucrites, olivine-eucrites, persthene-eucrites, hornblende-eucrites, uralite-eucrites, hornblendites, and vainites. Olivine always shows good coronas (reaction rims) of hypersthene, phibole, &c. Optical data are given for the several minerals, and curves for the tical orientation of the plagioclase. Hornblende as large (3½ inches) crystals in rnblende-eucrite gave analysis I by N. Sahlbom; it is only slightly titaniferous, t contains many microlites of ilmenite. Pargasitic hornblende from horn-ndite gave II.

	SiO_2.	TiO_2.	Al_2O_3.	Fe_2O_3.	FeO.	MnO.	MgO.	CaO.	Na_2O.	K_2O.
I.	42·80	3·80	12·71	1·85	10·70	0·15	14·24	11·36	1·34	0·54
II.	41·12	0·00	14·94	3·94	5·80	0·24	18·18	12·60	1·72	0·29

	H_2O+.	H_2O-.	F.	P_2O_5.	Total.	α.	γ.	$2V_\gamma$.	$c:\gamma$.
I.	0·22	0·06	0·00	0·00	99·77	1·6455	1·6635	96°	—
II.	0·48	0·20	0·10	0·10	99·71	1·6465	1·6655	82½°	18½°

L. J. S.

LKANOV (A. A.) Полканов (А. А.). К вопросу о генезисе титано-магнетитового оруденения габбро-сиенитов плутона Гремяха-Вырмес (Кольский полуостров).—*On the genesis of titanic magnetite-bearing gabbro-syenites of the Gremiakha-Vyrmes pluton, Kola peninsula.* Изв. Акад. Наук СССР, Сер. Геол. (Bull. Acad. Sci. URSS, Sér. Géol.), 1944, no. 6, pp. 34–51, 11 figs. (Russian with English summary.)

Some of the banded hortonolitites, peridotites, pyroxenites, and gabbros of this ality are very rich in ilmenite-magnetite ore. The late period of crystallization ore and hortonolite suggests that these minerals were formed from a residual

magma enriched in iron oxides and corresponding to a liquid in composition approaching either to the ore-silicate eutectic or to a liquid immiscible with magma. S. I. T.

Frohberg (M. H.). *Occurrence of gabbro-wehrlite near Lochalsh, Ontario.* Am. Min., 1944, vol. 29, pp. 299–304, 3 figs. Correction, p. 396.

The peridotitic rock consists of olivine and pyroxene with bytownite, &c. In the core of the intrusion the bytownite amounts to 20–45% and at the margin 10–20%, showing a gradation from mela-olivine-gabbro to gabbro-wehrlite (SiO_2 41·38, MgO 31·89, FeO 10·23%, &c.). L. J. S.

Patterson (Edward M.). *The olivine-gabbro of Ardtrea, County Tyrone.* Irish Nat. Journ. Belfast, 1944, vol. 8, pp. 171–176.

The gabbro mass intrusive into Triassic rocks three miles east of Cookstown is probably a sill of Tertiary age. The rock is an olivine-zeolite-gabbro composed of zonal olivine (inner Fa 23–27, outer Fa 38) often ophitic to felspar, plagioclase (labradorite-bytownite zoned by oligoclase-andesine), pyroxene ($2V$ 58°, $\gamma : c = 43°$) and iron-ore. The abundant mesostasis consists of thomsonite and chabazite. A chemical analysis of the rock is given. S. I. T.

Ray (S. K.). *Olivine-hypersthene-gabbros and -dolerites in Santal parganas, Bihar.* Quart. Journ. Geol. Mining Metall. Soc. India, 1941, vol. 13, pp. 103–164, 3 pls.

Olivine-hypersthene-gabbros and -dolerites intrusive into gneisses have been metamorphosed by later granitic intrusions causing an interaction between them and the gneisses with the production of hypersthene-granulites, amphibolites, hornblende-schists, and rarely epidote-pyroxene-garnet-rocks. Chemical analyses are given of the rocks and some optical data for the hypersthene, hornblende and augite. L. J. S.

Nel (H. J.). *The basal rocks of the Bushveld igneous complex, north of Pretoria.* Trans. Geol. Soc. South Africa, 1941, vol. 43 (for 1940), pp. 37–68, 1 map, 9 text-figs.

The so-called diabase crops out in a belt about two miles wide, rests on the Magaliesberg quartzite, and is separated from the overlying gabbro by a zone of quartzite xenoliths. It varies in composition symmetrically in such a way that in the middle horizon the orthopyroxene is greatest in quantity and richest in magnesia, while the plagioclase is richest in anorthite. Clinopyroxene, quartz, micropegmatite, hornblende, biotite, iron-ores, and apatite also occur. Only the margins show evidence of contamination by invaded sediments. The chief difference between the diabase and the gabbro is one of texture the former being medium to fine hypidiomorphic-granular. The variation in composition is ascribed to successive invasions. E. D. M.

Frankel (J. J.). *Studies on Karroo dolerites. 2. Some younger intrusions of olivine basaltic dolerite.* Trans. Geol. Soc. South Africa, 1943, vol. 45 (for 1942), pp. 1–26, 2 pls., 2 text-figs.

Dikes up to 60 cm. wide occur in Karroo dolerite near Aliwal North and are more basic than their host. The smallest are glassy with n 1·588 and sp. gr. 2·75.

wider ones are of olivine-dolerite consisting of olivine Fa_{17}, plagioclase An_{70}, oxene $Wo_{28}En_{46}Fs_{26}$, magnetite, and picotite. A chemical analysis is given ie pyroxene and four analyses of the dikes. They are considered to be derived n an original magma sub-layer. E. D. M.

KER (Frederick) & POLDERVAART (Arie). *The Karroo dolerites of the Calvinia district.* Trans. Geol. Soc. South Africa, 1942, vol. 44 (for 1941), pp. 127–150, 2 pls., 5 text-figs.

general summary is given of occurrences and of mineralogical and petro-hical features. Five general types are recognized depending on grain-size the presence of olivine or orthopyroxene, while special types are dolerite-natite and reaction-granophyre. There is no appreciable evidence of gravity-rentiation. The relationships between the pyroxenes are discussed and nples of syntectic phenomena are given. Two chemical analyses are quoted described as new, although one was published previously. [M.A. 8–241.] E. D. M.

KER (Frederick) & POLDERVAART (Arie). *The petrology of the Karroo dolerites between Sutherland and Middelburg, C. P.* Trans. Geol. Soc. South Africa, 1943, vol. 45 (for 1942), pp. 55–64.

addition to the types of dolerite previously recognized, hypersthene-dolerite Hanover, picrite from Middelburg, and a hydrothermally-altered dolerite Graaff Reinet are described with four chemical analyses by F. Herdsman. E. D. M.

KEIEFF (S. I.). *The Carboniferous lavas of the Ballycastle district.* Irish Nat. Journ. Belfast, 1943, vol. 8, pp. 67–72.

asic lavas of Calciferous Sandstone age in the NW. Antrim are described. y include basalts of Dalmeny, Jedburgh, and Markle types and spilites. In tes olivine is replaced by bowlingite, felspar is alkalinized and partly replaced hlorite and carbonates, pyroxene replaced by diabantite (the latter mineral occurs in vesicles), and ilmenite is replaced by leucoxene. Chemical analyses asalt (Jedburgh type), spilite, and diabantite are given. S. I. T.

OR (G. G.)] Моор (Г. Г.). К петрографии траппов низовьев реки Нижней Тунгуски. [*On the petrography of the traps in the lower part of the Lower Tunguska river.*] Труды Аркт. Инст. (Trans. Arctic Inst.), Leningrad, 1939, vol. 126, pp. 191–206. (Russian.)

KEEV (N. P.) & MOOR (G. G.).] Аникеев (Н. П.) & Моор (Г. Г.). Основные черты петрологии и металлогении траппов бассейна реки Северной. [*Salient features of the petrology and metallogeny of the traps in the Severnaya river basin.*] Ibid., 1939, vol. 126, pp. 247–276, 3 pls., 3 text-figs. (Russian.)

the vicinity of the Lower Tunguska river and its tributary the Severnaya , the Siberian traps are intrusive into limestones and other sediments of er Palaeozoic age. The traps are dominantly olivine-poor dolerites (47·4–% SiO_2), but include also picritic diabases, anorthositic rocks (Al_2O_3 28·95%; oclase zoned 97–75% An), hypersthene-dolerites, dolerite-pegmatites, and

hydrothermal albitites. Scapolite-calcite-rocks and sulphide ores occur in cou deposits. The petrogenesis is discussed with the aid of fourteen analyses of principal rock types. [M.A. **6**–320, 425.] C. F. I.

Bozhinsky (A. P.) Божинский (А. П.). Четвертичная базальтовая эффу в долине р. Джиды — юго-западное Забайкалье.—*The Quaternary basa effusions in the valley of the Dzhida river* (*southwest Transbaikalia*). Акад. Наук СССР, Сер. Геол. (Bull. Acad. Sci. URSS, Sér. Géol.), 19 no. 6, pp. 50–59, 3 figs. (English summary, pp. 58–59.)

Lava-flows up to 150 metres in thickness, emanating from a well-de volcanic cone, fill the valley of the river Dzhida and its tributaries for a dista well over 100 km. The lavas consist of porphyritic olivine-basalt with a vit phyric texture. An interesting feature of these lavas is that, besides a we developed columnar structure, they show spherical structures in the inner pa of the columns. Under a thin outer crust each basaltic column is made up of clo packed spheroids the size of a walnut, which, on exposure, easily fall apart. Fo chemical analyses of basalt and one of tuff are given. S. I. T.

Kupletsky (B. M.) Куплетский (Б. М.). Количественно-минералогичес классификация лампрофиров и их генезис.—*Quantitative mineralogi classification of the lamprophyres and their origin*. Изв. Акад. Наук СС Сер. Геол. (Bull. Acad. Sci. URSS, Sér. Géol.), 1944, no. 5, pp. 98–10 2 figs. (Russian with English summary.)

A new classification of the lamprophyres according to their mineral compositi is proposed. The modal composition of the lamprophyres is plotted on doub triangular diagrams. Two series of lamprophyres are distinguished: (1) diori syenite and (2) alkali; the latter are further subdivided according to the presen of melilite and other minerals. S. I. T.

[Chetverikov (S. D.)] Четвериков (С. Д.). О мончиките из Такоба (Тад ССР). Доклады Акад. Наук СССР, 1943, vol. 38, pp. 42–45, 1 fig.

Chetverikov (S. D.). *A monchikite from Takob* (*Tadjik Soviet Socialis Republic*). Compt. Rend. (Doklady) Acad. Sci. URSS, 1943, vol. 3 pp. 37–41, 1 fig.

Monchiquite occurring as a dike in biotite-granite shows p phyritic crysta of titanaugite and needles of barkevikite ($\gamma : c = 13°$, birefringence 0·020–0·02 2V 32°). A chemical analysis is given of the rock. L. J. S.

[Skhirtladze (N. I.)] Схиртладзе (Н. И.). Камптонито-мончикитовые жильны породы Кутаисского и Тквибульского районов. [*Camptonite-monchiqui dike rocks of the Kutais and Tkvibuli districts.*] Сообщения Акад. Нау Груз. ССР. (Bull. Acad. Sci. Georgian SSR), 1942, vol. 3, pp. 803–81 2 figs. (Russian with Georgian summary.)

Optical constants of the component minerals, modes, and chemical analys are given for camptonite and monchiquite from this series of dikes in Georgia. C. F. D.

rton (C. Osborne). *Limburgite from Nevis Bluff, Kawarau Gorge, central Otago.* Trans. Roy. Soc. New Zealand, 1943, vol. 73, pp. 58–67, 1 pl., 2 text-figs.

etrographical description of a limburgite dike, with chemical analysis. The ribution of lamprophyres and related rocks in South Island, New Zealand, is wn in a sketch-map. C. F. D.

ор (George) Моор (Георгий). *Micaceous kimberlites in the north of the Central Siberia.* Compt. Rend. (Doklady) Acad. Sci. URSS, 1941, vol. 31, pp. 363–365.

ficaceous kimberlite (analysis I, also BaO 0·42, H_2O- 1·48) with porphyritic ite from the upper Taimyra river and melilite-basalt (II, also H_2O- 0·76) n the Medvejaya river are compared with corresponding rocks from South ca. It is suggested that the region should be prospected for diamond.

SiO_2.	TiO_2.	Al_2O_3.	Fe_2O_3.	FeO.	MnO.	MgO.	CaO.	Na_2O.	K_2O.	H_2O+.	Total.
34·81	2·40	12·59	7·17	5·28	0·15	15·58	11·17	0·68	3·14	4·88	'99·65'
39·02	3·70	3·81	7·69	9·72	0·20	19·47	11·20	0·40	0·92	3·53	100·42

L. J. S.

nkel (J. J.). *Accessory heavy minerals in platinum ore of the Bushveld complex.* Trans. Geol. Soc. South Africa, 1943, vol. 45 (for 1942), pp. 75–78, 1 pl.

orite and chromitite near the Merensky Reef horizon contain small quantities utile, zircon, cassiterite, and scheelite. E. D. M.

benberg (W. R.). *The basal rocks of the Bushveld complex in the Marico district, south of Dwarsberg.* Trans. Geol. Soc. South Africa, 1943, vol. 45 (for 1942), pp. 81–108, 8 text-figs.

hese rocks consist of pyroxenite, chromitite, gabbro, harzburgite, and diabase, ı variable mineral composition illustrated by graphs and corresponding to lar variation in other areas. The invaded sediments are altered to cordierite nfels. E. D. M.

ock (R. W.) [1874–1935]. *Weathering of igneous rocks near Hong Kong.* Bull Geol. Soc. Amer., 1943, vol. 54, pp. 717–738, 3 figs.

chemical study of the weathering of lamprophyre, granites, rhyolites, and er acid plutonic and volcanic rocks under a tropical monsoon climate. Assum- alumina constant, the order of losses during weathering is lime, soda, and gnesia early; silica and potash commonly next; and iron and titania last, with e addition of these in exceptional cases. The chief product of weathering is ineral decomposable by dilute acid but otherwise like kaolinite. Numerous yses include twelve of the unaltered rocks. C. F. D.

donald (Gordon A.). *Solfataric alteration of rocks at Kilauea volcano.* Amer. Journ. Sci., 1944, vol. 242, pp. 496–505, 1 pl.

he action of sulphurous gases on olivine-basalt lava and ash has produced a e rock consisting mainly of opal with a little kaolin and relict ilmenite and netite. Most of the Mg, Ca, and Na, and much of the Al and Fe, have been oved; and there has presumably been an addition of silica, since the volume

of the rock has not been changed and the original structures are preserved. A l common type of alteration resulting in the removal of silica and the forma of limonite and goethite was probably effected by weak acid solutions. [M 6–221.] L. J. S

Sokolovsky (A. N.) Соколовский (А. Н.). Роль почвенных процессов генезисе лёсса.—*Role of soil forming processes in the genesis of loess.* Ак Акад. Наук СССР, Сер. Геол. (Bull. Acad. Sci. URSS, Sér. Géol.), 1 no. 6, pp. 125–144. (Russian with English summary.)

The hypothesis of eolian origin of loess is criticized and a new theory origin, through a process of weathering of carbonate soils in an arid climat proposed. S. I. T

McConnell (Duncan). *Phosphatization at Malpelo Island, Colombia.* Bull. G Soc. Amer., 1943, vol. 54, pp. 707–715, 2 pls.

A study of three rocks from Malpelo, a volcanic island in the eastern Paci Ocean (3° 59′ N., 81° 34′ W.). The specimens are an unaltered augite-andesit a phosphatized derivative of the andesite containing 87% phosphosiderit strengite (both $FePO_4.2H_2O$); and a phosphatized amygdaloid with variscite a metavariscite (both $AlPO_4.2H_2O$) in the vesicles. The phosphatizing solutio were derived from guano. C. F. D.

Rabinovich (S. D.) Рабинович (С. Д.). *Glauconite deposits in the Novo-Lia district on the eastern slope of the Urals.* Compt. Rend. (Doklady) Acad. Sc URSS, 1942, vol. 37, pp. 63–65.

Occurrences of glauconite-sandstones of Upper Cretaceous age are describe and tests made of their exchange ability for water softening. L. J. S.

[Teodorovich (G. I.)] Теодорович (Г. І.) Theodorovich (G. I.). *Dolomitiz tion of reefogenic formations in the oil-bearing region of Ishimbaevo.* Compt Rend. (Doklady) Acad. Sci. URSS, 1942, vol. 34, pp. 160–164.

—— *The process of dolomitization in the eastern massif of the Ishimbaevo oil-regio* Ibid., pp. 199–201.

Discusses the conditions for the action of $MgSO_4$ in sea-water on calcareou ooze in lagoons and on reef-formed limestone, and the simultaneous formation o dolomite and anhydrite. A detrital rock in a shallow basin surrounded by ree is a brown-grey dolomite with spots of blue anhydrite filling cavities, veinlets o anhydrite, and rosettes of quartz. L. J. S.

[Sarkisyan (S. G.)] Саркисян (С. Г.) Sarkisian (S. G.). *On the mineralog of Lower Cretaceous deposits of Kislovodsk.* Compt. Rend. (Doklady) Acad Sci. URSS, 1942, vol. 35, pp. 284–287.

The various heavy minerals separated from limestones, glauconitic sandstones and clays are angular fragments (except well-rounded grains of zircon and rutile) Spectroscopic analysis shows the presence of tin, indicating the presence also o rare grains of cassiterite. These minerals (except the zircon and rutile) have bee

ved from the local granitic rocks of the central Caucasus which contain con-
rable amounts of cassiterite. The limestones contain good crystals of
tine. L. J. S.

ERSON (Earl) & RAMISCH (Joseph L.). *Origin of shapes of quartz sand grains.* Amer. Min., 1942, vol. 27, pp. 595–606, 12 figs.

uartz grains in many metamorphic rocks tend to be elongated parallel to the is. A similar elongation has been observed in the grains of unmetamorphosed stones, as well as another elongation parallel to edges of the unit rhombo-on. From an experimental investigation of the fracture of quartz and from sion tests on oriented prisms, it is concluded that the elongation of quartz grains is due to original shape rather than to fracture and differential sion during transport. C. F. D.

ARDS (A. B.) & BAKER (G.). *Jurassic arkose in southern Victoria.* Proc. Roy. Soc. Victoria, 1943, n. ser., vol. 55, pp. 195–228.

ne fresh-water Jurassic rocks are chiefly arkose and mudstones, with some conglomerate, and coal. The arkose consists of angular grains of quartz 15 vol. %), felspars (25–35%, clear oligoclase and some cloudy orthoclase), te, and fragments of andesite tuff, cemented by chlorite (giving the rock its nish-grey colour), epidote, zoisite, and secondary felspar. In concretions, te has replaced the oligoclase, but not the orthoclase. Several chemical yses are given. L. J. S.

LARD (Fred M.). *Source of beach and river sands on Gulf Coast of Texas.* Bull. Geol. Soc. Amer., 1942, vol. 53, pp. 1021–1043, 3 pls., 7 text-figs.

his is a petrographical study of beach and river sands along the Texas coast e Gulf of Mexico. Each of the principal rivers carries a distinct suite of heavy rals. C. F. D.

GLAS (D. J.). *The importance of heavy mineral analysis for regional sedimentary petrology.* Report of the Committee on Sedimentation, 1939–40, Div. Geol. Geogr., Nat. Res. Council, Washington, D.C., 1940, pp. 102–121, 2 pls. (Mimeographed.)

laboratory methods adopted by a Dutch oil company for the petrological nination of sediments are described, and the interpretation of data thus ined is exemplified by discussion of a sequence of Upper Tertiary sediments eastern Java. C. F. D.

RY (K. O.). *Summary of Challenger Expedition bottom samples.* Rocks and Minerals, Peekskill, N.Y., 1945, vol. 20, pp. 3–6, 2 figs.

number of bottom deposits collected by this expedition have been re-ined by the author and graphs have been drawn showing the depth distribu-of sediments and authigenic minerals and also the percentage of certain rals and rocks in studied samples. J. M. S.

Miscellaneous

Kiryanov (R. N.) Кирьянов (Р. Н.). О сфалерите из Кузнечихинских ко… данных месторождений на Урале.—*On the sphalerite from the Kuznechi… sulphide ore deposits in the Urals.* Изв. Акад. Наук СССР, Сер. Геол. (Bu… Acad. Sci. URSS, Sér. Géol.), 1941, no. 6, pp. 72–76, 1 fig. (English summa… pp. 75–76.)

Large, well-formed, translucent crystals of blende are found in associati… with other sulphides in quartz-baryte veins in the region east of the Sverdlovs… Cheliabinsk railway. Three analyses are given: the first two, I yellow-gre… blende, and II brown blende, are associated with sulphide ore; and III la… honey-yellow crystals are found in the baryte rock. It is suggested th… analyses I and II are those of the primary blende, while analysis III is of blen… reprecipitated from the solution of the primary blende.

	S.	Zn.	Fe.	Mn.	Cd.	Sn.	Cu.	Pb.	SiO_2.	Total
I.	31·47	62·83	0·67	nil.	0·24	nil	0·98	2·03	0·11	98·33
II.	29·84	56·07	2·38	0·15	0·39	nil	0·48	9·08	0·35	98·74
III.	32·50	65·80	0·99	0·02	0·42	n.d.	0·05	0·08	0·11	99·97

S. I. T.

[Miropolsky (L. M.) & Borovik (S. A.)] Миропольский (Л. М.) и Боров… (С. А.), Результаты спектрального анализа ангидрита из пермски… отложений Татарии. Доклады Акад. Наук СССР, 1943, vol. 41, pp. 39… 398.

Miropolsky (L. M.) and Borovick (S. A.). *Results of spectrum analysis … anhydrite from the Permian deposits of Tataria.* Compt. Rend. (Doklad… Acad. Sci. URSS, 1943, vol. 41, pp. 382–383.

Large deposits of anhydrite are present in the Lower Permian; in the Upp… Permian it is mostly altered to gypsum [M.A. **9**–84]. Specimens from differen… localities and stratigraphical horizons were examined spectroscopically for … elements: Mg, Al, Si, Ca, Ti, Fe, Sr were found in all, Mn in some, and Cu, … only in the Upper Permian. L. J. S.

Tremblay (J.-Arthur). *Morphologie de l'idocrase.* Journ. Washington Aca… Sci., 1942, vol. 32, pp. 327–337, 6 figs.

From the frequency development of crystal-forms, according to the metho… of Donnay and Harker [M.A. **7**–241], the unit cell of idocrase is deduced … *a* 15·37, *c* 11·68 Å., and the space-group as $P4/nnc$, in agreement with X-ra… determinations [M.A. **5**–28]. L. J. S.

Donnay (J. D. H.). *The morphology of carborundum.* Trans. Roy. Soc. Canad… 1943, ser. 3, vol. 37, sect. 4, pp. 43–47, 1 fig.

The forms developed on carborundum, types I, II, III, conform exactly … the requirements of the classical or the generalized law of Bravais [M.A. 7–241… M. A. P.

Orcel (Jean) & Servigne (Marcel). *Recherche d'éléments rares dans quelqu… minéraux du calcium.* Compt. Rend. Acad. Sci. Paris, 1942, vol. 21… pp. 833–835.

Luminescence analysis shows no rare-earths in powellite from Lake Superi… copper deposits, but the presence of Ge. Traces of Pr and Sm were found … calcite from Missouri and aragonite from Spain. L. J. S.

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MINERALOGICAL MAGAZINE

CONTENTS OF No. 191

(December 1945)

PAGE

S. I. Tomkeieff: On the petrology of the ultrabasic and basic plutonic rocks of the Isle of Rum. (With Plate XII) 127

Tha Hla: Electrodialysis of mineral silicates: an experimental study of rock-weathering. (With Plate XIII) 137

MINERALOGICAL ABSTRACTS

(Vol. 9, No. 8, pp. 145–184)

Notices of Books (p. 145).—Rock-forming Minerals and Petrology (p. 148).—Miscellaneous (p. 184)

PAGE

Adamson, O. J. . 172
Adelhelm, W. . 154
Alderman, A. R. 155
Ambrose, J. W. 170
Anikeev, N. P. . 179
Astashenko, K. I. . . . 170
Baker, G. 168, 183
Bartrum, J. A. . 154
Basnett, E. M. . 166
Baturin, V. P. . 157
Bellanca, A. . 156
Belyankin, D. S. . . . 150
Benson, W. N. 151, 162
Betekhtin, A. G. . . 145
Bilibin, Y. A. . 175
Billings, M. P. 158
Borovik, S. A. . 184
Bozhinsky, A. P. 180
Brady, L. F. . 171
Bray, J. M. . 160
Brock, R. W. . 181
Buddington, A. F. . . . 157
Bulashevich, Y. P. . . . 172
Bullard, F. M. 183
Buntin, G. N. . 150
Chapman, R. W. 167
Cheng, Y. C. . 168
Chetverikov, S. D. . . . 180
Chudoba, K. F. 153
Coetzee, C. B. 164, 169
Cole, W. F. . 154
Combe, A. D. . 166
Davidson, C. F. 166
DeLury, J. S. . 158
Doeglas, D. J. . 183
Dolar-Mantuani, L. 150
Donnay, J. D. H. 148, 184
Dunne, J. C. . 169
Edwards, A. B. 161, 168, 183
Efremov, G. M. 149
Eitel, W. . . . 147
Eliseev, N. A. . 176
Emery, K. O. . 183
Emmons, R. C. . 148
Faust, G. T. . 156
Fellows, R. E. 170
Fenoglio, M. . 167
Fersman, A. E. 145–6
Frankel, J. J. 178, 181
Frechen, J. . 153
Freeman, G. O. 159
Frohberg, M. H. . . 178
Gates, R. M. . 148
Gerasimovsky, V. I. . . . 176
Gevers, T. W. . 169
Goldich, S. S. . 159
Grodzinski, P. . 147
Haff, J. C. 158, 177
Hentschel, H. . 171
Hess, H. H. . 151
Holgate, N. . 161
Holmes, A. . . 166
Hutton, C. O. 152, 156, 169, 181
Ingerson, E. . 183
Ivanov, A. A. . 161
Ivensen, Y. P. . 176
Jayaraman, N. 152, 168–9
Kashkai, M. A. 152
King, B. C. . . 165
Kiryanov, R. N. . . . 184
Klemen, R. . 153
Koritnig, S. . 150
Korzhinsky, D. S. . . 169
Kremers, H. E. 172–3
Kroksträm, T. 161
Kupletsky, B. M. . . . 180
Labuntzov, A. N. . . . 146
Larsen, E. S. . 174
Larsson, W. . 177
LeMesurier, C. R. . . . 173
Liebenberg, W. R. . . . 181
Lightfoot, B. . 159
Lizunov, N. V. . 161
Lombaard, B. V. 159
Lundegårdh, P. H. 149, 160, 177
McConnell, D. 182
Macdonald, G. A. 149, 151, 162, 171, 181
Machatschki, F. . . . 153
Martinenghi, M. 173
Mathisrud, G. C. . . . 159
Matley, C. A. . 156
Maucher, A. . 150
Merriam, R. . 163
Michot, P. . . 150
Miles, K. R. . 153
Miropolsky, L. M. . . . 184
Moor, G. G. 179, 181
Movsesyan, S. A. . . . 155
Naidu, P. R. J. 150–1
Nel, H. J. . . 178
Nikitin, V. V. . 153
Nikolaev, V. A. 158
Orcel, J. . . 184
Pagliani, G. . 173
Patterson, E. M. 165, 178
Pecora, W. T. . 173
Pichamuthu, C. S. 154, 170
Poldervaart, A. . . . 179
Polkanov, A. A. 175–7
Polkvoi, O. S. . 165
Postel, A. W. . 154
Prider, R. T. . 154
Putman, H. M. . 151
Quinn, A. . . 161
Quirke, T. T. 172–3
Rabinovich, S. D. . . . 182
Ramisch, J. L. . 183
Rao, B. R. . . 175
Rao, M. R. S. . 156
Raw, F. . . . 156
Ray, S. K. . . 178
Razumovsky, N. K. . . . 158
Read, H. H. . 163
Reynolds, D. L. 164
Rittenhouse, G. . . . 159
Rodolico, F. . 160
Rukavishnikov, F. I. . . . 164
Sandell, E. B. . 159
Sarkisyan, S. G. . 152, 182
Schwartz, G. M. . . . 171
Senero, E. . . 167
Servigne, M. . 184
Shand, S. J. 157, 174
Shimer, J. A. . 160
Shipley, R. M. . 148
Skhirtladze, N. I. . . . 180
Sobolev, N. D. . 167
Sobolev, V. . 153
Sokolovsky, A. N. . . . 182
Solodovnikova, L. L. . . . 148
Starrabba, A. S. 156
Steinbach, E. . 149
Sverzhinskaya, E. A. . . . 176
Switzer, G. . 168
Teodorovich, G. I. . . . 182
Tomkeieff, S. I. 179
Tomlinson, W. H. . . . 155
Tôrre de Assunção, C. F. 152
Trembiay, J. A. 184
Turner, F. J. 154–5, 169
Uspensky, N. M. 172
Walker, F. 151, 179
Watson, K. DeP. . . . 167
Webb, R. W. 171, 174
Wolff, T. . . . 156
Zatokovenko, V. A. . . . 162
Zavaritzky, A. N. 147–8, 157 163, 171
Zuffardi, P. . 167

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